Hot Melt Applicators
Series 2000

Part 104 443A

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Country	Telephone	Facsimile
Argentina	54-1-921-3058	54-1-924-3206
Australia	61-2-838-7144	61-2-838-7394
Austria	43-222-707-5521	43-222-707-5517
Belgium	32-2-720-9973	32-2-720-7371
Brazil	55-11-274-6011	55-11-632300
Canada	416-475-6730	416-475-8821
Chile	56-2-555-7190	56-2-551-7549
Colombia	57-4-266-6965	57-4-266-5716
Denmark	45-42-648-500	45-42-641-101
France	33-1-64-12-14-00	33-1-64-12-14-01
Germany	49-211-2002-0	49-211-254658
Greece	30-1-941-9058	30-1-942-7623
Hong Kong	852-4287228	852-4804685
India	91-22-6442852	91-22-6427520
Italy	39-2-9078-23-40	39-2-9078-24-85
Japan	81-3-3450-8818	81-3-3472-3301
Korea	82-2-428-1931	82-2-427-9387
Malaysia	60-3-703-7248	60-3-791-5152
Mexico	216-988-9411/4315	216-985-3710
Netherlands	31-3403-77812	31-3403-74189
New Zealand	64-9-634-0179	64-9-579-7797
Norway	47-2-656100	47-2-658858
Pakistan	92-21-568-8609/3869	92-21-568-4585
Philippines	63-2-721-1421	63-2-721-3927
Portugal	351-2-941-3874	351-2-941-3867
Puerto Rico	809-787-2474	809-780-6063
Singapore	65-459-9533	65-459-9514
Spain	34-6-3705013	34-6-3705004
Sweden	46-40-291-585	46-40-932-882
Switzerland	41-61-463-838	41-61-463-818
Taiwan	886-2-581-3172	886-2-581-3074
Thailand	66-2-5141159	66-2-2531571
Turkey	90-1-384-4085	90-1-372-1528
United Kingdom	44-84421-3171	44-84421-5358
USA: Continental	770-497-3400	770-497-3500
Alaska & Hawaii	770-497-3400	770-497-3500
Venezuela	58-2-939-111	58-2-938097

Eastern Europe, Africa & Middle East, contact:
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Distributor & Export Department 49-211-2002-0 49-211-254652

Issued 3/05
US contact numbers updated 3/05
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306-18-662

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SAFETY SUMMARY

INTRODUCTION

Here you will find safety guidelines for the use of Nordson equipment. These guidelines apply to anyone working with Nordson equipment, including operations and service personnel. They are repeated throughout this manual, along with specific warnings and cautions not included in this section. These safety guidelines cover:

- Installation.
- Equipment operation.
- Working with hot melt materials.
- Use of hot melt solvents.

Failure to follow these recommendations may result in personal injury from burns or electrocution and/or equipment and property damage.

EXPLANATION OF TERMS AND SYMBOLS

The following symbols are used in Nordson publications to alert the reader to potential physical harm or equipment damage:

WARNING:	CAUTION:
Failure to observe may cause DEATH or PERSONAL INJURY	Failure to observe can cause DAMAGE TO EQUIPMENT
General	General
Electrical	
Nozzle	
Hot	
Pressure	

Figure 1 - Nordson Corporation Safety Symbols

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SAFETY DURING INSTALLATION

ELECTRICAL

- A protective electrical ground connection to a reliable earth ground is essential for safe operation. Without one, all accessible conductive components (including knobs and controls that appear insulated) can render an electric shock.
- A disconnect switch with lockout capability must be provided between the power source and the equipment.
- The power supply wire gauge and insulation must be sufficient to meet the temperature and power requirements.
- Only fuses of the correct type, voltage rating and current rating should be used. Refer to the Nordson equipment parts list for fuse recommendations. Using incorrect or nonrecommended fuses can present a fire hazard.

PNEUMATIC

Nordson recommends installing a lockout, three-way, manual valve in the air supply line to the filter/regulator. This valve makes it possible to relieve air pressure and lock out the pneumatic system before undertaking maintenance or repairs.

GAS-SYSTEM (Pertains to FoamMelt® Applicators and Nitrogen Blanket Kits Only)

Cylinders of compressed gas are under high pressure and can present significant safety hazards if handled improperly. Refer to OSHA General Industry Standards, paragraphs 1910.101, 1910.166 and 1910.167 for safety precautions that apply to the use, handling and storage of compressed air.

SAFETY DURING OPERATION

Do NOT operate Nordson equipment under the following conditions:

- At a pressure higher than the rated maximum working pressure of any component in the system.
- Near volatile or otherwise explosive gases or materials.
- Without the covers, panels and safety guards properly installed.
- At temperatures below 20° F (-6° C) or above 120° F (50° C).

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- With hoses enclosed in any material that interferes with heat dissipation. This includes electrical conduit, insulation of any type or tight metal covers.

- With large areas of hoses in contact with a cold floor, cold supports or other such surfaces. Cold points along the hose restrict the flow of adhesive inside the hose and can create potential problems during operation.

- (If outdoors or in drafty areas) with the applicator guns unshielded from the wind. Rapid heat dissipation due to air movement across the guns may cause operational problems.

- With handgun trigger left unlocked while the gun is unattended.

In addition:

- Use only the metal base when attempting to lift or move this equipment. Do not use equipment covers, doors, panels or hose connectors as braces or grips.

- Never use this equipment as a ladder or stepping stool.

- Route all hoses so as to prevent damage from kinking, abrasion and other physical damage. Do not allow a hose to be installed with a bend radius of less than 6 inches (150 mm).

- Never point an applicator handgun at yourself or anyone else.

SAFETY DURING SERVICING

- Do not perform internal service or adjustment on any equipment unless another person capable of rendering first aid and resuscitation is present.

- Only qualified personnel should service Nordson equipment.

- To avoid personal injury, never touch exposed connections and components while power is ON. Dangerous voltages exist at several points in the equipment.

- Disconnect, lock out and tag external electrical power before removing protective panels or replacing electrical components.

- Remove all jewelry (rings, watches, etc.) before servicing equipment.

- If possible, stand on a rubber mat when servicing Nordson equipment. Do not work on equipment if standing water is present. Avoid working in a high-humidity atmosphere. Cover exposed terminals and work area with rubber sheeting to avoid accidental contact while the power is ON.

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- Always wear safety glasses, protective gloves (Nordson P/N 902 514 or equivalent) and long-sleeved protective clothing to prevent injury from hot applicator parts, splashed hot melt adhesive and hot gun surfaces.

- To prevent serious injury from molten adhesive under pressure, always relieve system hydraulic pressure (by triggering the handgun, for example) before opening any hydraulic fitting or connection).

- Never use an open torch, drill or broach when cleaning a nozzle.

- Never continue to operate equipment with a known leak in the system.

SAFETY WHEN USING HOT MELT ADHESIVES AND SOLVENTS

HOT MELT ADHESIVES

- Use extreme care when working with molten materials. They solidify rapidly at high temperature and present a hazard. Severe burns can occur if the molten materials come in contact with the skin. Even when first solidified, they are still hot.

- Always wear protective clothing and eye protection when handling molten material or working near equipment containing hot melt adhesives under pressure.

HEATING SOLVENTS

- Do NOT use an open flame or uncontrolled heating device to heat solvents (for example, a small pan on an unregulated hot plate).

  Avoid fire hazard by using only a controlled heating device to heat solvents (for example, a small deep fat fryer or thermostatically controlled hot plate).

- DO NOT USE PAINT-TYPE SOLVENTS UNDER ANY CIRCUMSTANCES! These solvents are volatile and may create a fire and/or toxic vapor hazard even at room temperature.

- Always be sure the work area is adequately ventilated. Avoid prolonged or repeated breathing of solvent vapors.

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HALOGENATED HYDROCARBON SOLVENTS

Halogenated hydrocarbon solvents are dangerous when used to clean aluminum components in a pressurized fluid system. No available stabilizers prevent halogenated hydrocarbon solvents from reacting under all conditions with aluminum components in a pressurized fluid pumping system.

NEVER clean any aluminum component or flush any system using halogenated hydrocarbon solvents. Use Type R solvents or contact your solvent or hot melt supplier for a non-halogenated hydrocarbon solvent for cleaning and flushing.

Halogenated fluids include the following solvents:

Fluorocarbon Solvents:	Dichlorofluoromethane Trichlorofluoromethane
Chlorinated Solvents:	Carbon Tetrachloride Chloroform Dichloromethane Ethylene Dichloride Methylene Chloride Monochlorobenzene Monochlorotoluene Orthodichlorobenzene Perchloroethylene Trichloroethylene
Brominated Solvents:	Ethylene Dibromide Methyl Bromide Methylene Chlorobromide
Iodinated Solvents:	Ethyl Iodide Methyl Iodide N-butyl Iodide Propyl Iodide

IF MOLTEN MATERIAL COMES IN CONTACT WITH THE SKIN

- Do NOT try to remove molten material from the skin.
- Immediately immerse the affected area in cold, clean water. Keep the affected area immersed until the material has cooled.
- Do NOT try to remove the cooled material from the skin.
- Cover the affected area with a clean wet compress.
- In cases of severe burns, look for signs of shock. If shock is suspected, have patient lie down, use blankets to preserve body heat and elevate the feet several inches.
- Call a physician immediately.

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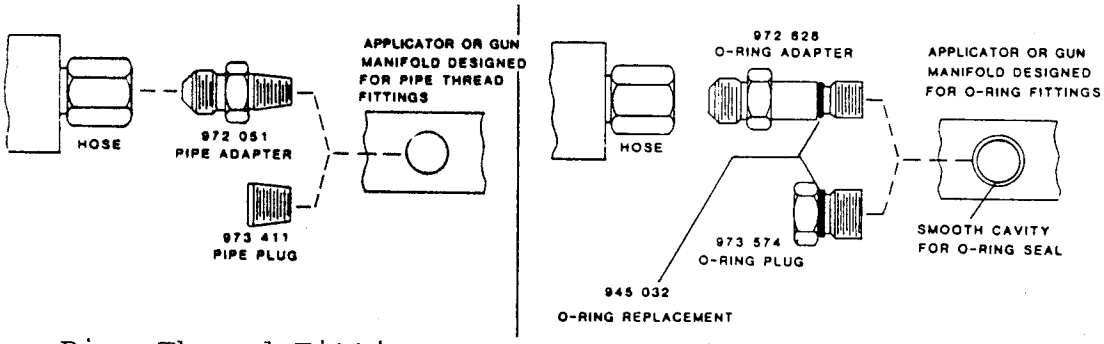
IDENTIFICATION AND USE OF NORDSON FITTINGS

There are two different types of hose adapters and pipe plugs used on Nordson equipment, one with an o-ring seal and one with a pipe-thread seal. Some Nordson H20 noncirculating automatic guns, H200 automatic guns, and Series 2000 applicators use hose fittings and pipe plugs with o-ring seals for the fluid ports. These o-ring fittings, which have straight pipe threads, are not interchangeable with the fittings which rely on tapered pipe thread (NPT) for a seal.

The use of the incorrect fitting may result in excessive leakage and possibly in serious burns, especially with low viscosity fluids.

1. Identification of Fittings Required: To determine which type of fittings should be used with any given gun or applicator, first look at the fluid ports in the manifold. The ports designed for the o-ring fittings will have a smooth machined cavity on the face of the manifold around the female threads whereas the ports designed for the pipe-thread fittings will have only female pipe threads. See Figure 1 for an illustration of the difference.

2. Selection of Correct Parts: Use Figure 1 to select the correct part.



Pipe-Thread Fittings And Manifold of Gun or Applicator

O-Ring Fittings And Manifold of Gun or Applicator

Figure 1 - Diagram of O-Ring and Pipe-Thread Fittings for H20 Noncirculating Guns, H200 Automatic Guns, and Series 2000 Applicators

3. Installation of O-Ring Fittings:

   (a) Lubricate the fitting threads and o-ring with Never Seez (P/N 900 344), making sure first that the o-ring and threads are free of dirt and other foreign particles.

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(b) Thread the fitting by hand into the threaded port in the gun or applicator.

(c) Tighten the fitting only enough to seat. It should seat when the body of the metal fitting contacts the manifold surface. Between 7 and 10 ft-lbs of torque is required to create an effective seal.

⊘ Any time the fitting is removed, the o-ring must be replaced. Otherwise the o-ring will not seat properly. Use only Nordson o-rings, P/N 945 032.

4. Replacement of O-Rings:

(a) Be sure that the o-ring (Nordson P/N 945 032) and its groove are free of foreign particles.

(b) Stretch the o-ring and carefully roll it over the threads onto the groove in the hose adapter or pipe plug. Take care not to stretch the o-ring any more than necessary.

(c) Install fitting according to instructions in step 3.

A complete listing of Nordson fittings and their o-ring replacements, where replacements are available, is provided in the chart below:

Description of Fitting and Where Used		Pipe-Th. Fitting	O-Ring Fitting
Str. Conn.	(Gun to Automatic Hose; Applicator to Automatic or Handgun Hose)	972 051	972 628
Pipe Plug	(Extra Ports on Gun or Applicator)	973 411	973 574
90° Elbow	(Gun to Automatic Hose)	972 200	274 180*
90° Elbow	(Applicator to Automatic or Handgun Hose)	972 200	972 646*
45° Elbow	(Gun to Automatic Hose)	972 618	274 179*
45° Elbow	(Applicator to Automatic or Handgun Hose)	972 618	972 647*
Str. Conn.	(FM150/170 to Hose)	-	310 281

* For instructions on installation of o-ring elbow fittings, see page 46-33-1.

Note: P/Ns 972 646 and 972 647 have an extended collar which allows them to be wrenched into the hose ports in the manifold.

An adapter which will allow guns designed for o-ring fittings to be attached to a standard 1/4 inch tapered pipe-thread fitting is available from Specials (P/N 806 724). Primarily it is used in existing installations. It may need to be insulated to prevent excessive heat loss.

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SECTION I
EQUIPMENT FAMILIARIZATION

INTRODUCTION

The Nordson Series 2000 Hot Melt Applicators melt and pump hot melt adhesives and other thermoplastic materials with viscosities within the range of 500 to 50,000 centipoise (cs) through hoses and extrusion guns to a substrate. The applicators melt the adhesive in an aluminum tank with a cast-in heater. An air driven spur gear pump submerged in the tank or an air driven dual-acting piston pump transfers molten adhesive into a distribution manifold, through a filter and heat exchanger, and into heated hoses and extrusion guns. Figure 1 shows the Series 2000 hot melt applicator.

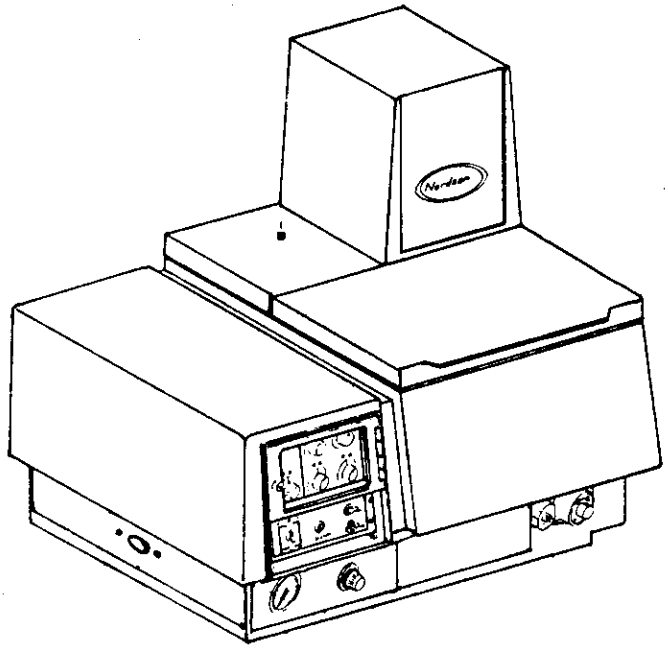

Figure 1 - Series 2000 Hot Melt Applicator

The tank and hoses are heated electrically and controlled independently by means of resistance temperature detectors in the tank and hoses, and solid-state circuitry in the applicator. Extrusion guns are heated by cartridge heaters and controlled by open-on-rise thermostats in the guns. Depending on the material being melted, the Model 2002/2004 has a melt rate of 14 lb/hr (6.4 kg/hr) and the Model 2202/2204 has a melt rate of 22 lb/hr (10.0 kg/hr). Maximum delivery rate (instantaneous) with the gear pump or piston pump is noted in the Specification Summary.

The Series 2000 hot melt applicators are shipped from the factory with the pump and air control assembly completely installed and with the manifold on the right side of the applicator.

Because some applications require that hoses be routed from the left side of the applicator, the temperature control panel and electrical panel are interchangeable with the heat sink at the back of the unit. The air control panel can also be moved to the back of the unit.

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Additionally, the tank lid hinge can be moved such that the lid will open to the left or to the right as required by the installation.

SPECIFICATION SUMMARY

Tank Volume	
2002/2004	288 cu in. (4717 cu cm)
2202/2204	540 cu in. (8847 cu cm)
Tank Capacity*	
2002/2004	10.4 lb (4.7 kg)
2202/2204	19.5 lb (8.9 kg)
Melt Rate (nominal)	
2002/2004	14 lb/hr (6.4 kg/hr)
2202/2204	22 lb/hr (10.0 kg/hr)
Pump Rates, max	
Piston Pump	54 lb/hr (24.5 kg/hr)
Gear Pump	68 lb/hr (31.0 kg/hr)
Tank Heating Method	Cast-in resistive heating element
Tank Heater Power Requirement	
2002/2004	2310 watts at 208 VAC
2202/2204	3000 watts at 208 VAC
Ambient Temperature Range	35° to 120°F (0° to 50°C)
Operating Temperature Range	Linear calibration from 200° to 425°F (93° to 218°C) plus open-ended scale from 150° to 200°F and 425° to 450°F
Operating Air Pressure	
Piston Pump	10 to 60 psi (69 to 412 kPa)
Gear Pump	5 to 80 psi (138 to 447 kPa)
Hose Capacity	
2002/2202	2 (48 ft max)
2004/2204	4 (64 ft max for 230 VAC hoses; 58 ft max for 200 VAC hoses)
Electrical Requirements**	180 to 256 VAC, 50/60 Hz, 3/1 phase; 380 VAC, 50/60 Hz 3 phase only
Dimensions	See Figure 2

* Tank capacity shown is an approximation based on the specified tank volume and the use of an adhesive with a specific gravity of 1.0. Tank capacity will be greater for adhesives with high specific gravities, less for adhesives with lower specific gravities. Under actual operating conditions, tank capacities may be somewhat lower than calculated, since tanks are not always filled completely.

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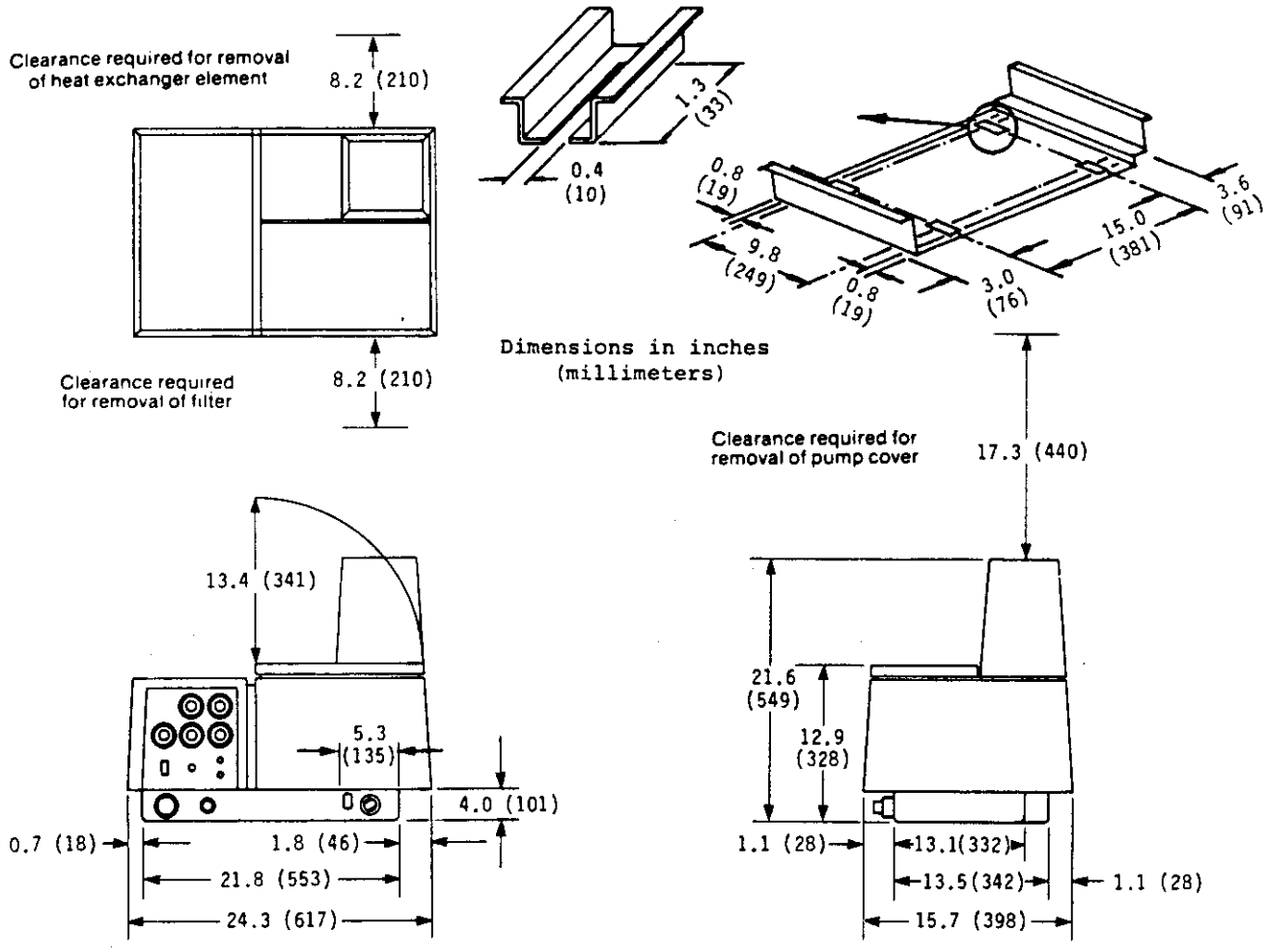

Figure 2 - Series 2000 Dimensions

FUNCTIONAL DESCRIPTION

The following paragraphs detail the configuration and operation of the Series 2000 hot melt applicators. Feature variations and options are also discussed for comparison.

HOT MELT TANK

Each applicator melts adhesive or other thermoplastic materials in a cast aluminum tank with a cast-in resistive heating element. The loading lid and condensate pan prevent spillage of excess hot melt adhesive onto the exterior of the applicator. The two piece loading

---

** The actual power requirement for the Series 2000 hot melt applicators is determined by the additive power requirements of individual components used in the applicator system. The total requirement depends on tank size, quantity and length of hoses, and quantity and type of guns used. See Table 5 in Section V, Diagrams and Tables for individual component power requirements.

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lid further functions to prevent the introduction of dust and other contaminants into the tank. Once the unit has cooled down, the inner lid cannot be removed. The outer lid may be opened to facilitate removal of the fiberglass enclosure for maintenance. The tank mounts directly onto the adhesive distribution manifold. A drain valve on the back of the tank allows the tank to be drained directly without going through the pump and manifold.

Temperature control is accomplished by means of a resistance temperature detector (RTD) mounted on the tank and solid-state circuitry located in the electrical enclosure. The temperature control range is from 200° to 430°F (90° to 220°C), although this range may be extended down to 150°F (65°C) and up to 450°F (230°C) with some reduced accuracy at the extremes. Over-temperature protection is provided by a close-on-rise thermostat set at approximately 500° to 550°F (260° to 290°C) to trip the applicator main circuit breaker through its auxiliary coil.

HOT MELT ADHESIVE PUMP CONFIGURATION

The Series 2000 applicators incorporate either an air driven spur gear pump or an air driven dual-acting piston pump to transfer molten adhesive material from the tank to the distribution manifold. A piston pump is normally used with low to medium viscosity materials in applications not requiring high cycle speeds and in applications insensitive to pressure pulsations. The gear pump is normally used with medium to high viscosity materials in applications requiring high cycle rates and constant pressures.

Air Driven Dual-Acting Piston Pump Assembly

The air driven dual-acting piston pump assembly consists of a regulator, solenoid valve, air piston with 4-way control valve, and a dual-acting hydraulic pump. The air cylinder and hydraulic cylinder are tied together through a common shaft. A crossover tube connects the output of the hydraulic pump to the distribution manifold. Figure 3 shows a schematic of the dual-acting air driven piston pump.

The spring-loaded ball and seat arrangement at the bottom of the hydraulic cylinder and the relative volumes of the areas above and below the hydraulic piston cause adhesive to be forced under pressure through the crossover tube into the manifold on both the up and down strokes of the air piston. An optional high viscosity ball and seat assembly is available to increase the working viscosity range of the piston pump.

Overpressure protection is provided by a relief valve in the adhesive manifold that opens at 1600 psi (11.0 MPa) to relieve system pressure back to the adhesive tank.

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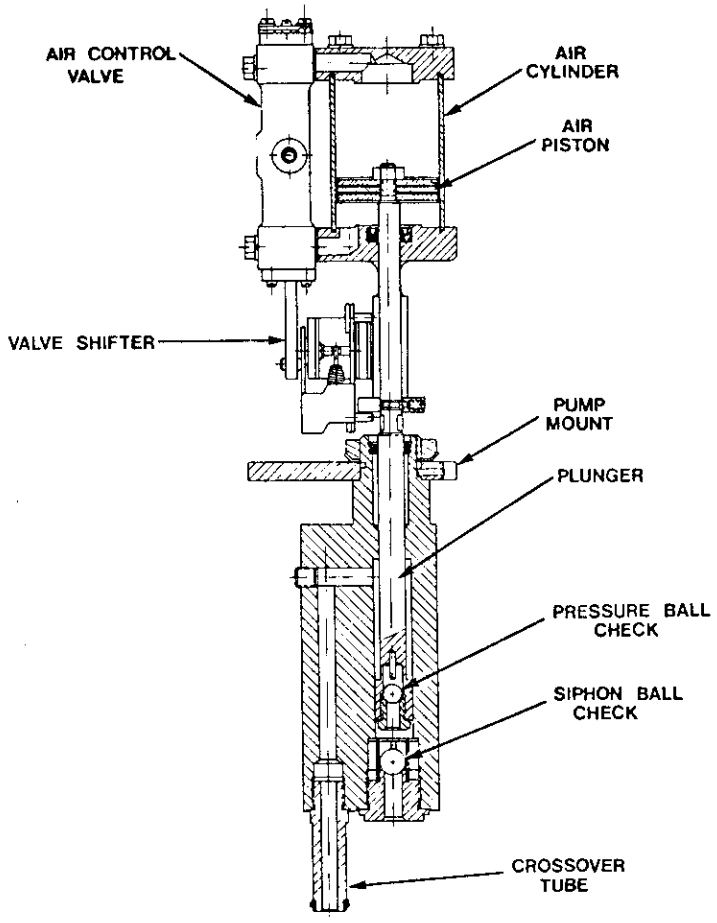

Figure 3 - Air Driven Dual-Acting Piston Pump

Air Driven Spur Gear Pump Assembly

The air driven gear pump assembly consists of a regulator, solenoid valve, rotary air motor, speed reducer, gear pump, and pressure control valve. The pump is suspended from the speed reducer enabling rapid extraction from the melt tank for servicing, similar to the air driven piston pump configuration. Figure 4 details the air driven spur gear pump and associated drive components.

The air motor is a rotary vane-type motor designed to provide adequate torque to maintain nominal shaft speed under pump load conditions at 80 psi (550 kPa) maximum input air pressure. The motor and drive are sealed to prevent damage or corrosion due to exposure to moisture and adhesive materials.

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The speed reducer is an 8.75:1 reduction gear that enables the rotary air motor to run at an optimum maximum speed of 1750 rpm while the gear pump runs at an optimum maximum speed of 200 rpm. An insulator between the gear reducer and pump mount protects the reducer from tank heat.

The spur-type gear pump provides a constant pressure output without the pressure fluctuations encountered in a piston pump as the piston reaches the end of its stroke in each direction. Extremely precise deposition control is possible with this gear pump arrangement.

Due to the tight tolerances within the gear pump that enable it to dispense adhesive materials extremely high and extremely low in viscosity, internal circulation of adhesive material is necessary to prevent the pump from stalling or the pressure relief valve from opening during application. The pressure control valve maintains a constant pressure in the system regardless of the condition of the extrusion guns (i.e., open or closed) by circulating a small portion of adhesive material from the outlet of the pump back to the tank. The floating spool in the pressure control valve also compensates for pressure fluctuations that occur as the extrusion

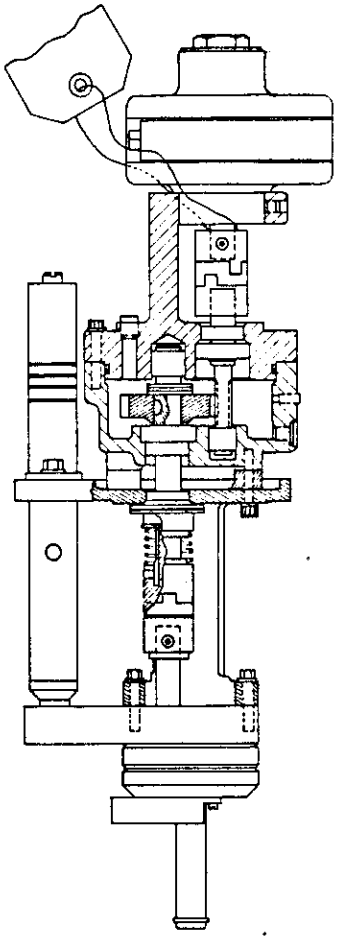

Figure 4 - Gear Pump Drive Assembly

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guns are cycled. In an air motor driven gear pump applicator where extremely precise weight control or where extremely low output rates are required in both continuous and intermittent applications, improved performance is obtained with the pressure control valve because recirculation back to the tank enables the pump to run at a higher, more consistent speed than would be possible without the pressure control valve.

Overpressure protection is provided by a relief valve in the distribution manifold set to open at 1600 psi (11.0 MPa) to relieve system pressure at the outlet of the pump back to the tank.

ADHESIVE DISTRIBUTION MANIFOLD ASSEMBLY

An aluminum adhesive distribution manifold assembly mounted on the bottom of the hot melt tank in the Series 2000 applicators receives hot melt adhesive from the air driven pump, filters and reheats the adhesive, and distributes the hot melt adhesive to the heated hoses and extrusion guns.

The filter assembly consists of a core and fine mesh screen to filter out particulate contaminants and char. The filter is threaded onto a threaded sleeve to prevent overtorquing and allow easy removal for inspection and cleaning.

A finned core heat exchanger in the adhesive path reheats adhesive from the tank to application temperature. Because the tank is mounted directly to the manifold, the heat exchanger and manifold are also heated by the tank heaters. The heat exchanger comes into effect when fresh adhesive added to the tank drops the temperature of the adhesive being pumped into the manifold and when pumping high flowrates.

A drain valve in the manifold allows material to be pumped through the filter assembly without using hoses and extrusion guns. The valve also provides a convenient method to prevent pressure buildup in the system during maintenance operations.

Hoses may be connected to the side, bottom or back of the distribution manifold.

TANK, HOSE, AND GUN TEMPERATURE CONTROLS

The temperature controller in the Series 2000 applicators is a solid-state device that monitors and controls the temperatures within the hot melt tank and heated hoses. The temperature controller utilizes five separate control channels (three in the 2002/2202 applicators). Each channel has a dial potentiometer, a yellow light emitting diode (LED), and a red LED. The yellow LED glows continuously when temperature is below the dial set point, flashes when the controller is maintaining the set temperature, and remains

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dark when temperature exceeds the set point by approximately two degrees. The red LED indicates overtemperature conditions. The red LED glows when temperature reaches the halfway point between the dial set point and 500°F (260°C). Both LED's also act to indicate RTD or circuit problems. These problem indications are presented in Table 3.

Temperature is sensed in the tank and in each of the hoses by a resistance temperature detector (RTD) in each component. Each RTD has a calibrated operating range of 200° to 430°F (90° to 220°C) with limited accuracy down to 150°F (65°C) and up to 450°F (230°C).

Gun temperature is maintained by the use of a cartridge heater in series with an open-on-rise thermostat. The standard gun configuration utilizes a 350°F (175°C) thermostat. Optional thermostats are available within a range from 225° to 450°F (105° to 230°C).

Overtemperature Protection

RTD open and short circuits and overtemperature conditions within the hose and on the tank wall are indicated on the temperature control panel by the red and yellow LED's in each channel.

A time delay resistive-type heating device set at approximately two minutes allows time for corrective action before the temperature control circuitry opens the main circuit breaker through its auxiliary trip coil. Because the time delay relay is both voltage and temperature sensitive, the time delay will range from one to five minutes, and once activated, may take as long as fifteen minutes before the device cools down enough to allow the relay contacts to open. Until the contacts open, the main circuit breaker will continue to trip open.

When temperature rises above 500°F (260°C) on the surface of the tank, a close-on-rise thermostat energizes the circuit breaker auxiliary trip coil to open the main circuit breaker.

Actual tank and hose temperature can be determined by rotating the temperature control knob until the yellow LED begins to flash. The setting at this point corresponds to actual tank or hose temperature.

Extrusion gun circuits are powered directly from the main circuit breaker through the normally closed gun circuit breaker. Turning the hose control knob to the OFF position de-energizes only the hose heating circuit. Additionally, if the gun is disengaged at the quick disconnect coupling the sockets on the hose end of the coupling are electrically energized. Disconnect and lock out input electrical power to the applicator if any part of the system is to be worked on to prevent severe electrical shock or equipment damage.

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SECTION II
PREPARATION FOR USE

INTRODUCTION

The Series 2000 hot melt applicators are shipped in an assembled condition with the manifold on the right side in the configuration specified on the purchase order. The applicators are factory wired for 230 VAC, three-phase input electrical power. Hoses and guns are shipped separately. The following paragraphs detail information necessary for proper installation of the applicator, hoses, and guns. The Appendix at the end of this service manual describes the proper electrical and pneumatic conversion that will permit hoses to be connected to the left side of the applicator.

UNPACKING

No special instructions are necessary to unpack the Series 2000 applicators. Normal care should be exercised not to damage the equipment during unpacking.

⊘ Do not attempt to lift the applicator by any of the fiberglass panels or hose connectors. Lift the unit from the metal base.

INSPECTION

After unpacking, the following inspection should be performed.

1. Inspect surfaces for evidence of cracks in the fiberglass cover, scratches, corrosion, and other physical damage.
2. Remove the electrical enclosure and inspect for loose electrical connections and loose contaminants.
3. Inspect hose for broken connectors, rips in the outer cover, and evidence of kinks or other damage.
4. Inspect guns for loose mechanical and electrical connections.
5. Inspect all fasteners and mechanical connections for tightness.

INSTALLATION

GENERAL

1. Install the hot melt applicator so panels can be removed and the unit is otherwise accessible for operation.

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2. Avoid unusual ambient temperature conditions, i.e., below 30°F (0°C) or above 120°F (50°C).

3. The applicator should also be protected from unusual dust conditions and severe vibration.

4. If the applicator is installed outdoors or in a drafty area, the guns must be shielded from the wind. Rapid heat dissipation due to air movement across the guns can prevent the guns from operating properly.

5. Hoses and guns are shipped separately and must be attached when the applicator is installed.

Hose and gun installation and air connection must precede connection of electrical power to the applicator.

GUN INSTALLATION (H20 or H200 Automatic Gun)

1. Install the gun on the parent machine in proper alignment with the substrate.

   NOTE: The gun mount should be protected from vibration and secured so that the gun will not change position during application.

   NOTE: Nordson recommends the installation of a heated or non-heated inline filter between the gun and hose.

2. Connect the hose mechanically to the gun.

3. Connect the hose electrically to the gun.

Ensure the pins are properly aligned and the connectors are locked together.

4. Connect a filter/regulator and solenoid valve to the gun.

   NOTE: The solenoid valve should be placed as close as practical to the gun to prevent introduction of lag time between solenoid valve actuation and gun operation.

5. Set the regulator to zero pressure (full counterclockwise) and connect external air supply.

   NOTE: The air supply should deliver a minimum of 50 psi (345 kPa) to the filter/regulator to ensure proper gun operation.

6. Connect solenoid leads to the appropriate timing device.

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APPLICATOR INSTALLATION

1. Mount the hot melt applicator securely to the parent machine so that controls and panels are accessible.

   Do not attempt to lift the applicator by any of the fiberglass panels or hose connectors. Lift the unit from the metal base.

2. Route hoses from guns to applicator.

   Hoses must be routed to prevent damage from kinking, abrasion, and other physical damage. Do not allow the hose to be installed with a bend radius less than 6 in. (15 cm). Do not overtighten hose support clamps.

3. Starting with the port nearest the filter bung, secure the hoses to the applicator manifold using the fittings provided with the hoses. A hose should always be connected to the end port nearest the filter bung. However, if only bottom hose ports are to be used, then a hose must be connected to the bottom port nearest the filter bung.

   Failure to connect a hose to the manifold connection (Hose No. 1) nearest the filter bung could result in serious burns from sprayed hot material when a manifold plug is removed.

4. Set air pressure regulator for zero pressure (full counter-clockwise) on applicator front panel.

5. Connect an air supply to the applicator on the left-hand side of applicator base. Use teflon paste (P/N 900 236) on threads.

   NOTE: The air supply should be capable of supplying a minimum of 80 psi (550 kPa) to the applicator. The supply to the piston pump should be filtered. The supply to the gear pump should be filtered and lubricated. Nordson offers an optional filter and lubricator for use here. See Section VI, Illustrated Parts List for part numbers. Nordson also recommends that a shutoff valve be installed in the supply line to isolate the applicator supply air for maintenance. The valve must be customer furnished.

6. On units equipped with gear pump assemblies, check gear reducer lubrication in the following manner:

   a. Remove the tank upper enclosure by removing one captive screw.

   b. Remove the plastic plug from the top of the gear reducer housing.

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c. Carefully remove the pipe plug from the side of the gear reducer housing.

NOTE: Lubricant should be at the level of the plug hole in the side of the unit. If the gear reducer is full, allow the unit to drain to the level of the plug hole. If the level is low, refill to the level of the plug hole using Nordson lubricant P/N 275 338.

If the gear reducer is overfilled, the energy used in churning the excess oil can result in overheating. If the gear reducer is underfilled, the resultant friction can also cause overheating.

d. Replace the pipe plug in the side of the housing. Use teflon paste (P/N 900 236) on threads.

e. Install the vent plug in the plastic bag in the place of the plastic plug. Use teflon paste on threads.

ELECTRICAL INSTALLATION

The Series 2000 hot melt applicators are factory wired for use on a three-phase service line. The following instructions are divided into two section: one covering electrical installation for 200/230 VAC units and the other covering installation of 380Y/220 VAC units. In addition to describing the steps required for connecting three phase power to the applicator, instructions are also included for changing jumpers and wires to accept single phase input power.

Single-phase electrical installation of the Series 2000 applicators is significantly different from any other Nordson hot melt equipment. Failure to follow the installation instructions can result in serious equipment damage or electrical shock.

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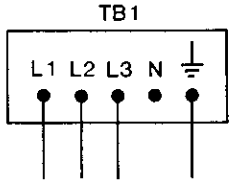
200/230 VAC INSTALLATION

Three-Phase Installation

1. Check that the applicator main circuit breaker is OFF.
2. Set tank and hose temperature controls to minimum setting (full counterclockwise).
3. Remove top left-hand enclosure and back panel to expose electrical subplate by removing three captive screws.
4. Route a 200/230 VAC, three-phase service line through the hole in the control cabinet base and electrical subpanel. Make electrical connections at the five-station input terminal block (TB1) as shown below.



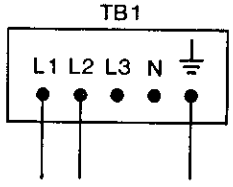
200/230 VAC Three-Phase Connection

5. Attach the applicator to an earth ground through GND (TB1-5).
6. Attach and secure the electrical enclosure cover and continue with Setup and Initial Operation.

Do not energize input electrical power at this time. Connect input power at the appropriate step in the Setup and Initial Operation procedure.

Single-Phase Installation

1. Check that the applicator main circuit breaker is OFF.
2. Set tank and hose temperature controls to minimum setting (full counterclockwise).
3. Remove top left-hand enclosure and back panel to expose electrical subplate by removing three captive screws.
4. Route a 200/230 VAC, single-phase service line through the hole in the control cabinet base and electrical subpanel. Make electrical connections at the five-station input terminal block (TB1) as shown below.



200/230 VAC Single-Phase Connection

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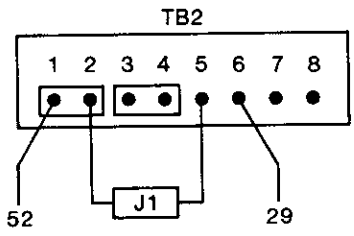
5. Attach the applicator to an earth ground through GND (TB1-5).

6. On TB2, move the jumper on the terminals 4 and 5 to terminals 3 and 4 and move the jumper wire on terminals 3 and 6 to terminals 2 and 5. TB2, configured for single phase operation, is shown below.



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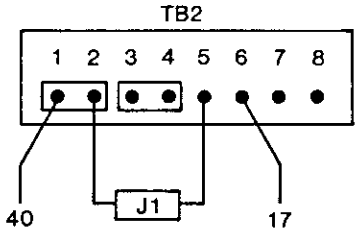

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7. Attach and secure the electrical enclosure cover and continue with Setup and Initial Operation.

Do not energize input electrical power at this time. Connect input power at the appropriate step in the Setup and Initial Operation procedure.

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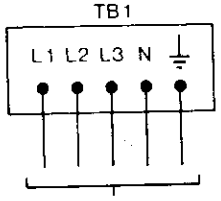
380Y/220 VAC INSTALLATION

Three-Phase Installation

1. Check that the applicator main circuit breaker is OFF.
2. Set tank and hose temperature controls to minimum setting (full counterclockwise).
3. Remove top left-hand enclosure and back panel to expose electrical subplate by removing three captive screws.
4. Route a 380Y/220 VAC, three-phase, 4 wire service line through the hole in the control cabinet base and electrical subpanel. Make electrical connections at the five-station input terminal block (TB1) as shown below.



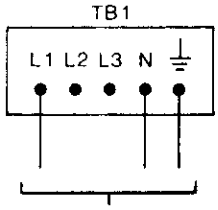
380Y/220 VAC Three-Phase 4 Wire Connection

5. Attach the applicator to an earth ground through GND (TB1-5).
6. Attach and secure the electrical enclosure cover and continue with Setup and Initial Operation.

Do not energize input electrical power at this time. Connect input power at the appropriate step in the Setup and Initial Operation procedure.

Single-Phase Installation

1. Check that the applicator main circuit breaker is OFF.
2. Set tank and hose temperature controls to minimum setting (full counterclockwise).
3. Remove top left-hand enclosure and back panel to expose electrical subplate by removing three captive screws.
4. Route a 220 VAC, single-phase 4 wire service line through the hole in the control cabinet base and electrical subpanel. Make electrical connections at the five-station input terminal block (TB1) as shown below.



220 VAC Single-Phase 4 Wire Connection

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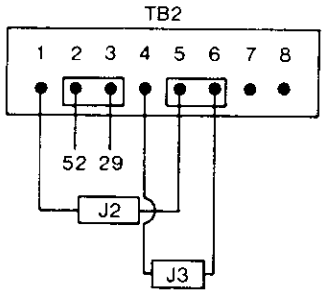
5. Attach the applicator to an earth ground through GND (TB1-5).

6. Using the two jumper wires shipped with the applicator, attach one jumper wire to terminals 1 and 5 on TB2 and attach the other jumper wire to terminals 4 and 6 on TB2. TB2, configured for single phase operation, is shown below.



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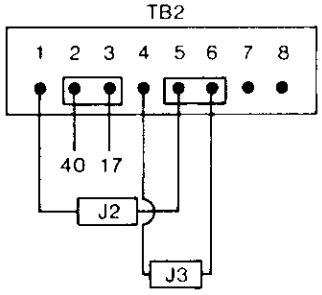

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7. Attach and secure the electrical enclosure cover and continue with Setup and Initial Operation.

Do not energize input electrical power at this time. Connect input power at the appropriate step in the Setup and Initial Operation procedure.

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SECTION III
OPERATING INSTRUCTIONS

SETUP AND INITIAL OPERATION

Wear safety glasses, safety gloves (P/N 902 514), and protective clothing to prevent injury from hot applicator parts, splashed hot melt adhesive material, and hot gun surfaces.

The Series 2000 hot melt applicators, hoses, and guns contain energized electrical components with potentials that could be fatal. Only qualified personnel shall operate this equipment.

Do not trigger guns with cold material in the guns. Damage may result to the ball and piston seat or module seals.

1. Check air pressure to pump at zero pressure on gauge.
2. Fill the adhesive tank with clean hot melt adhesive material.
3. Close applicator tank lid immediately to prevent introduction of contaminants.
4. Set tank temperature control to the recommended temperature for the adhesive being applied.

   NOTE: Hose temperature controls should remain at minimum setting (OFF position on dial).

   When the main circuit breaker is closed, the guns will also start to heat, regardless of the position of the hose temperature control knob.

5. Energize input electrical power.
6. Close main circuit breaker.

   NOTE: Yellow LED indicator above tank temperature control knob should glow steadily.

7. After 15 minutes, increase hose temperature controls to application temperature of adhesive.

   Never allow an empty hose to remain at application temperature for more than 15 minutes. Damage may result to the hose when it is pressurized.

   NOTE: As the components of the applicator system (i.e., tank and hoses) reach application temperature, the yellow LED indicators will start to flash.

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8. Remove the upper tank enclosure. (GEAR PUMP applicators only)

9. Set the pressure control valve indicator at the approximate mid-point of the scale. (GEAR PUMP applicator only)

10. When the adhesive material in the tank becomes molten, increase air pressure to the pump to 20 psi (140 kPa).

    NOTE: The pump will transfer adhesive material from the tank to the manifold, hoses, and guns. The system is full when the pump stalls or slows noticeably.

11. Increase air pressure to the guns to 20 psi (140 kPa).

Trapped air in the hoses and guns may cause spitting of air and molten adhesive when the guns are initially triggered, especially if the nozzles are left on the guns. Shield the area and operator from splashed material.

12. Remove nozzles and trigger the guns to allow adhesive to flow through the entire system to flush any solvent and impurities from the tank, hoses, and guns.

    NOTE: It may be necessary to increase pump air pressure slightly to achieve flow in the system.

13. When adhesive flows free of any solvent or contaminants, deactivate guns.

14. Reduce pump air pressure to zero at the regulator.

15. Trigger guns momentarily to relieve trapped hydraulic pressure.

16. Open the manifold drain valve.

17. Attach nozzles to guns.

18. Remove and clean adhesive filter in accordance with Section IV, Filter Assembly Cleaning.

19. Replace filter and close manifold drain valve.

20. Adjust input air pressure to the pump to 20 psi (140 kPa).

21. Set pressure control valve in accordance with Section III, Pressure Control Valve Adjustment (GEAR PUMP Applicators only).

22. Replace upper tank enclosure (GEAR PUMP applicators only).

23. The system is ready for use.

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PRESSURE CONTROL VALVE ADJUSTMENT (GEAR PUMP Applicators Only)

The pressure control valve is adjustable and must be set according to the requirements of the particular application. To reduce the amount of circulation back to the tank and increase system pressure, turn the adjusting screw clockwise. Conversely, to increase circulation and reduce system pressure, turn the adjusting screw counterclockwise. Use the following procedure to set the pressure control valve.

NOTE: The visible screw on the side of the pressure control valve indicates the position of the control valve and acts as a stop in the full open and full closed positions.

1. With all guns open and the pressure control valve fully closed (turned full clockwise), increase pneumatic pressure to the air motor until the appropriate bead size is achieved.

2. Open the pressure control valve by turning counterclockwise until the valve is fully open.

3. With all guns closed and the pneumatic pressure set as determined in Step 1, turn the adjusting screw on the pressure control valve clockwise until the air motor slows noticeably, but is still running continuously.

4. With the guns cycling normally, adjust pneumatic pressure to the air motor and the position of the pressure control valve until the desired bead size is achieved.

DAILY OPERATION

DAILY STARTUP PROCEDURE

1. Turn ON applicator main circuit breaker.

2. Adjust tank and hose temperature controls to desired settings.

3. When all yellow LED indications are flashing or off, adjust input air pressures to the pump and guns to the desired settings.

4. Check tank level and add adhesive material as necessary.

DAILY SHUTDOWN

1. Shut OFF main circuit breaker.

2. Reduce pump and gun air pressures to zero at the regulators.

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TECHNICAL PUBLICATION

ADHESIVE LOADING

Refill adhesive tank with fresh, clean adhesive to a point 1 in. (2.5 cm) below the top of tank when the material level in the tank drops below one-half full.

NOTE: Keeping adhesive level in the tank above the half-full point eliminates the problem of starving the pump because the tank runs out of molten adhesive.

To prevent the adhesive supply from becoming contaminated, store the fresh adhesive in a closed container.

⊘ Be certain the adhesive added is clean and free of contaminants. Do not allow contaminants or foreign material to enter the hot melt tank. Foreign particles may lodge in the pump and cause it to stall or be damaged. Foreign particles passing through the pump can clog the filter screen.

Check the tank strainer occasionally for large particle contaminants. Do not operate the applicator without the tank strainer in place.

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DAILY START-UP

1. Turn the applicator ON. Allow the adhesive in the tank to melt.
2. Adjust tank and hose temperature controls to the desired settings.
3. Adjust input air pressures to the pump and guns to the desired settings.
4. Check tank level and add adhesive material as necessary.

DAILY SHUTDOWN

1. Shut the applicator main circuit breaker OFF.
2. Reduce pump and gun air pressures to zero at the regulator.

SAFETY PRECAUTIONS

1. Do not touch the hot melt guns when in use. They are hot.
2. Reduce pump air pressure to zero and relieve hydraulic pressure by triggering the gun before removing the adhesive filter or opening the manifold drain valve.
3. Shut OFF the applicator main circuit breaker before opening the electrical enclosure.

OPERATION

Set the tank and hose temperature controllers and air pressure to the settings recommended by Nordson personnel and/or adhesive representative.

Tank Temperature	_____ °F
Hose Temperature	_____ °F
Gun Temperature (Thermostat)	_____ °F
Pump Air Pressure	_____ psig
Gun Air Pressure	_____ psig

REMOVE THIS PAGE FROM THE SERVICE MANUAL
HANG IT NEAR YOUR APPLICATOR FOR REFERENCE

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SECTION IV
MAINTENANCE

INTRODUCTION

Both preventive maintenance and corrective maintenance procedures are presented in the following paragraphs. Preventive maintenance procedures describe measures such as periodic inspections, nozzle cleaning, and material changeover. Corrective maintenance procedures describe equipment troubleshooting, removal and replacement of assemblies, and disassembly and repair of particular components in the system.

The Series 2000 hot melt applicators, hoses, and guns contain energized electrical components with potentials that could be fatal. Disconnect and lock out input electrical power before performing maintenance on this equipment. Only qualified personnel shall operate this equipment.

Wear safety glasses, safety gloves (P/N 902 514), and protective clothing to prevent injury from hot applicator parts, splashed hot melt adhesive material, and hot gun surfaces.

Relieve system pressure before breaking any mechanical connections (i.e., gun/hose connection, filter, etc.) in the following manner:

a. Reduce pump air pressure to zero at the regulator.

b. Trigger all guns to relieve trapped hydraulic pressure.

c. Open the manifold drain valve.

d. Reduce gun air pressure to zero at the regulator.

Never heat any component with a torch or other open flame. If it becomes necessary to heat components for maintenance or repair, use an electric oven with forced air circulation or a flameless electric heat gun.

Halogenated hydrocarbon solvents are dangerous when used to clean components in a pressurized fluid system. See the Safety Summary, Section 40-1, for further details. Use of halogenated hydrocarbon solvents in this system could result in an explosion.

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PREVENTIVE MAINTENANCE

GENERAL MAINTENANCE

1. Keep applicator clean at all times.

2. Hot melt adhesive material supply must be be kept clean and free of contaminants. Foreign particles in the hot melt adhesive can block the filter or ruin the pump. A plugged filter can shut down the system.

3. Flush the adhesive filter daily.

4. Periodically clean regulator air filter.

5. Periodically clean manifold heat exchanger.

6. Periodically clean the inside of the electrical enclosure.

7. Check electrical connections and terminal blocks periodically for security.

   ⊘ Vibration and heating/cooling cycles may loosen terminals resulting in possible damage to electrical components or improper system operation.

8. Lubricate piston pump shaft and trip collar semiannually with lubricant P/N 900 252 (PISTON PUMP applicators only).

9. Change speed reducer lubricant semiannually or after every 1000 hours of operation, whichever comes first. Use only gearbox lubricant P/N 275 338 in this unit. (GEAR PUMP applicators only)

   ⊘ Nordson lubricant P/N 271 416 will not perform satisfactorily in these units. The gear reducer will overheat using this lubricant. Use only Nordson lubricant P/N 275 338.

MATERIAL CHANGE

If the old and new adhesives are compatible, add the new adhesive to the tank. If the old and new adhesives are not compatible, flush the system using the procedures detailed in Section IV, System Cleaning. Contact your adhesive supplier for compatibilities and acceptable flushing solvents.

⚠ Do not flush the system with halogenated hydrocarbon solvents. See the Safety Summary, Section 40-1, for further details. Using halogenated hydrocarbon solvents in this system could cause an explosion.

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NOZZLE CLEANING

Nozzle clogging occurs when a filter screen is damaged or when there is charred material in the hose or gun. Char can occur when an adhesive is heated above the application temperature recommended by the adhesive manufacturer. If this occurs, it may be necessary to replace the hose and/or gun.

Do not heat Type R solvent above 475°F (245°C). See 59-1 for further details. Do not heat Type R solvent with an open flame or in an unregulated heating device (i.e., a small pan on an unregulated hot plate). A fire hazard exists if an open flame or unregulated hot plate is used to heat Type R solvent. A controlled heating device (i.e., a small deep fat fryer or thermostatically controlled hot plate) must be used to heat the solvent above the melting temperature of the hot melt adhesive material.

Wear safety glasses, safety gloves (P/N 902 514), and protective clothing to prevent injury from hot applicator parts, splashed hot melt adhesive material, and hot gun surfaces.

Use the following procedure to clean gun nozzles:

1. Heat the gun to operating temperature.
2. Reduce pump air pressure to zero at the regulator.
3. Trigger all guns to relieve any trapped hydraulic pressure in the system.
4. Open manifold drain valve.
5. Reduce gun air pressure to zero at the regulator.

Failure to relieve system pressure could result in serious burns when the nozzle is removed.

6. Remove the nozzles.
7. Place nozzles in a container of Type R solvent and heat the solvent to the melting temperature of the adhesive material being used.

Solvents may present a toxic or fire hazard, even at room temperature. Use extreme care in selecting a cleaning solvent other than Type R solvent.

Some solvents may not be compatible with the hot melt adhesive material. Sludge formation can further compound the problem. Test the solvents with a small sample of adhesive before using the solvent in the system.

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8. Clean the nozzle bore with a pin-type probe inserted into the nozzle in a direction opposite to the flow of adhesive.

   NOTE: See 43-2 for specific information on Nordson nozzle cleaning kits.

   Do not use an open torch, drill, or broach to clean a nozzle. Damage may result.

   NOTE: Alternate nozzle heating and cleaning methods may include:

   a. Heat components with a flameless electric heat gun. Wipe nozzles with a clean cloth.

   b. Submerge parts in a ultrasonic cleaner.

   c. Submerge parts in a chemical cleaner.

9. Reassemble nozzle onto guns.

10. Restore system to normal operation.

FILTER ASSEMBLY CLEANING (Figure 13)

Clean adhesive filter once a week, unless operating experience indicates more or less frequent cleaning is required. A complete filter assembly is recommended as a spare for faster filter changes. Hot melt system must be at operating temperature before filter is removed for cleaning.

Wear safety glasses, safety gloves (P/N 902 514), and protective clothing to prevent injury from hot applicator parts, splashed hot melt adhesive material, and hot gun surfaces.

Use the following procedure to clean the adhesive filter:

1. Heat the system to operating temperature.

2. Reduce pump air pressure to zero at regulator.

3. Momentarily trigger all guns to relieve trapped hydraulic pressure.

4. Open manifold drain valve over an open container.

5. Increase pump air pressure until adhesive material flows steadily from the drain. Allow material to flow until it is clean and free from all contaminants.

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6. Shut off input air pressure to the pump at the regulator.

Failure to relieve system pressure can result in serious burns when the filter is removed.

7. Unscrew filter assembly and remove from manifold.

8. Remove screw (10) from filter bung (1) and disassemble filter.

Do not heat Type R solvent above 475°F (245°C). See 59-1 for further details. Do not heat Type R solvent with an open flame or in an unregulated heating device (i.e., a small pan on an unregulated hot plate). A fire hazard exists if an open flame or unregulated hot plate is used to heat Type R solvent. A controlled heating device (i.e., a small deep fat fryer or thermostatically controlled hot plate) must be used to heat the solvent above the melting temperature of the hot melt adhesive material.

9. There are several methods for cleaning a hot melt filter screen depending on the type of hot melt adhesive material used, as noted below:

   a. Place the filter components in a container of Nordson Type R solvent and heat above the melt temperature of the adhesive. Scrub screen with a fine bristle brush.

Do not use a metal brush. Damage may result to the screen mesh preventing proper operation of the filter.

   b. Screens may be heated with a flameless electric heat gun. Wipe screen with a clean, dry cloth.

   c. Use an ultrasonic cleaner filled with solvent to clean screen.

10. Inspect the screen (7) for damage.

NOTE: Any dents or breaks in the mesh indicate damage beyond repair. Replace with a new screen. The Series 2000 applicators are shipped with a 0.006 inch mesh filter screen. This screen should always be smaller than the smallest nozzle orifice. Optional filter screens are available. See Section VI, Illustrated Parts List for optional filter screens.

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11. Slide screen over core (8).

12. Place support (9) on the end of the screen, insert screw (10) through core into filter bung, and tighten screw.

13. Inspect o-ring (2) for damage.

    NOTE: Inspect o-ring for cuts, hardening, and other physical damage. Replace if necessary with Nordson P/N 941 230.

14. Screw filter assembly into the manifold, finger tight only.

15. Increase input air pressure to the pump and purge filter as outlined in step 5.

16. Close manifold drain valve.

17. Tighten filter snugly. Do not overtighten.

⊘ Ensure manifold is at operating temperature when the filter is reinstalled. Cold material on filter and/or manifold walls can cause filter screen to collapse if filter is tightened in a cold system.

SPEED REDUCER LUBRICATION (GEAR PUMP Assembly Only)

Initial Oil Change

The oil in a new speed reducer should be drained, using the drain plug provided, at the end of 250 hours of operation.

Routine Oil Change

Under normal conditions after the initial change, the speed reducer oil should be changed after every 1000 hours of operation or every six months, whichever comes first. Under severe conditions (rapid temperature fluctuations; moist, dirty, or corrosive environment), it may be necessary to change oil at more frequent intervals. Use only gearbox lubricant P/N 275 338 in this unit.

⊘ Nordson lubricant P/N 271 416 will not perform satisfactorily in these units. The gear reducer will overheat using this lubricant. Use only Nordson lubricant P/N 275 338.

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Overfilling or Underfilling

If a speed reducer is overfilled, the energy used in churning the excess oil can result in overheating. If the speed reducer is underfilled, the resultant friction can also cause overheating.

If overheating occurs, completely drain the housing and flush thoroughly with a light flushing oil. Fill the housing until lubricant begins to drain from the oil level plug hole. Reinstall the oil level plug. Restart the drive.

Storage

If a speed reducer is to be idle for an extended period of time, such as when it is stored as a spare, fill the unit completely with oil to protect interior parts from rust and corrosion due to condensation inside the housing.

Ensure that the speed reducer housing is drained to the proper level before placing the speed reducer in service.

SYSTEM CLEANING

The entire hot melt application system must be flushed periodically to remove excess dirt and charred material. Use the following procedure to clean out and change adhesive material.

Some solvents may not be compatible with the hot melt adhesive material. Sludge formation can further compound the problem. Test the solvent with a small sample of the adhesive before using the solvent in the system.

Wear safety glasses, safety gloves (P/N 902 514), and protective clothing to prevent injury from hot applicator parts, splashed hot melt adhesive material, and hot gun surfaces.

Relieve system pressure before breaking any mechanical connections (i.e., gun/hose connection, filter, etc.) in the following manner:

a. Reduce pump air pressure to zero at the regulator.

b. Trigger all guns to relieve trapped hydraulic pressure.

c. Open manifold drain valve. (Unit must be at operating temperature before valve is opened.)

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1. With unit at operating temperature, remove all adhesive from system by pumping adhesive through gun with nozzle removed, through hose disconnected from gun, or through manifold by opening manifold drain valve.

   ⊘ If the guns are removed from the hoses, the pins on the hose quick disconnects are electrically energized with full voltage. Contact with these pins can cause severe electrical shock or equipment damage.

2. Reduce pump air pressure to zero at the regulator as draining is completed.

3. Place several pounds of fresh, uncontaminated adhesive material normally used in production into the applicator tank.

4. Allow material time to melt, then pump the molten material through the system.

   ⊘ Type R solvent may be used instead of adhesive material to flush the tank, pump, and manifold components. Do not pump Type R solvent through the hoses. Solvent absorbed by char in the hoses may leach out during later operations resulting in reduced adhesive bond strength or odor contamination of packaged food products. The solvent can also cause large pieces of char to break off during later operations resulting in clogged nozzles.

   ⚠ Do not use halogenated hydrocarbon solvents. Refer to Safety Summary, 40-1 for further details. Using halogenated hydrocarbon solvent in this system could result in an explosion.

   NOTE: System can be flushed best if molten adhesive is circulated through pump and hoses with hoses positioned over the tank. Flush the system for 15 minutes.

5. If necessary, remove the tank from the applicator. Use a stiff bristle brush to scrub the inside of the tank. When finished, replace the tank and applicator cover.

   ⊘ The tank is teflon coated. Using a metal brush or scraper will remove the teflon coating.

6. When all of the cleaning agent has been pumped through the system, decrease pump air pressure to zero.

7. Remove and clean adhesive filter.

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8. Disconnect and lock out input electrical power.

9. Reconnect guns to hoses.

10. Restore system to normal.

CORRECTIVE MAINTENANCE

Obvious causes of malfunction, such as broken wires and missing fasteners, are generally not considered as part of corrective maintenance. These types of failures should be noted and eliminated during periodic cleaning and inspection, unless the failure presents an immediate hazard to the equipment or to personnel.

Tables 1 and 3 present a summary of the mechanical and electrical troubleshooting charts, respectively. Only typical faults and probable causes are listed. If the cause of failure is readily apparent, refer to the appropriate Troubleshooting Chart for corrective action. The alphanumeric designation listed in the Reference column specifies the step in the Troubleshooting Chart.

Tables 2 and 4 present the mechanical and electrical troubleshooting charts, respectively, for the Series 2000 hot melt applicators. The tables introduce typical fault situations and the procedural steps necessary to isolate and confirm the fault. Alphanumeric designations in these tables serve to organize the tables into related groups of procedural steps. The tables then specify the corrective action to be taken based on the results of the associated procedural statement. A normal indication usually requires continuation of the fault isolation procedures or a re-evaluation of the fault. The charts designate specific steps for gear pump and piston pump configurations.

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TABLE 1 - TROUBLESHOOTING CHART - MECHANICAL SUMMARY

FAULT CONDITION	PROBABLE CAUSE	REF
AIR MOTOR NOT STROKING (Piston Pump) OR ROTATING (Gear Pump)	Cold adhesive in tank.	A1
	Cold joints in hydraulic system.	A3
	No air pressure to gun solenoid valve.	A4
	Faulty gun solenoid valve.	A5
	Guns not firing due to clogged nozzles.	A5
	Adhesive filter blocked.	A6
	Adhesive heat exchanger blocked.	A6
	No air pressure to air piston/ motor.	A9
	Faulty pump solenoid valve.	A10
	Air cylinder leakage (piston pump only).	A11
	4-way air valve damage (piston pump only).	A14
	Air cylinder mechanical failure (piston pump only).	A15
	Hydraulic cylinder malfunction (piston pump only).	A15
	Air motor malfunction (gear pump only).	A16
	Speed reducer malfunction (gear pump only).	A21
	Gear pump malfunction (gear pump only).	A21
AIR MOTOR STROKING (Piston Pump) OR ROTATING (Gear Pump) TOO FAST	Pump starved.	B1
	Pressure relief valve stuck open.	B2

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TABLE 1 - TROUBLESHOOTING CHART - MECHANICAL SUMMARY

FAULT CONDITION	PROBABLE CAUSE	REF
AIR MOTOR STROKING (Piston Pump) OR ROTATING (Gear Pump) TOO FAST (Continued)	Hydraulic cylinder malfunction (piston pump only).	B4
	Pressure control valve stuck open (gear pump only).	B5
AIR MOTOR STROKING (Piston Pump) OR ROTATING (Gear Pump) ERRATICALLY	Pump starved.	C1
	Hydraulic cylinder malfunction (piston pump only).	C2
	Input air pressure too high (gear pump only).	C4
	Pressure control valve stuck open (gear pump only).	C5

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TABLE 2 - TROUBLESHOOTING CHART - MECHANICAL

If the applicator is operable, flush the system before disassembly. If the pump is not operable but the heating system is functional, bring the unit to operating temperature and drain to ease disassembly. Otherwise, a heat gun or other flameless heating method must be used to melt solidified adhesive material on internal parts.

Before removing any panels to start disassembly, turn main switch OFF and disconnect and lock out input electrical power to prevent injury from energized electrical components.

Relieve system pressure before attempting to loosen any part of manifold, hose, and gun system by securing air to pump, triggering all guns, and opening manifold drain valve.

Wear safety glasses, safety gloves (P/N 902 514), and protective clothing to prevent injury from hot applicator parts, splashed hot melt adhesive material, and hot gun surfaces.

Review the Safety Summary, 40-1, before attempting to perform maintenance on this equipment.

AIR MOTOR NOT STROKING (Piston Pump) OR ROTATING (Gear Pump)

A1. Check tank temperature for indication corresponding to setting on controller.

NORMAL INDICATION: Temperature in tank corresponds to setting. Proceed to next step.

ABNORMAL INDICATION: See Electrical Troubleshooting Chart for corrective action.

A2. Reduce pump air pressure to zero, crack open manifold drain valve, and then increase air pressure to the pump. Check for adhesive flow.

NORMAL INDICATION: Air motor starts to stroke (or rotate) when valve is opened. Blockage is downstream of the drain valve. Proceed to next step.

ABNORMAL INDICATION: If the air motor does not stroke (or rotate), blockage is upstream of the drain valve. Proceed to step A8.

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TABLE 2 - TROUBLESHOOTING CHART - MECHANICAL (Continued)

A3. Check for cold joints in hydraulic system.

NORMAL INDICATION:	ABNORMAL INDICATION:
All joints in hydraulic system are hot. Proceed to next step.	If a cold joint is identified, install insulation around joint. If insulation is not enough, install a heated inline filter at the joint.

NOTE: Refer to Electrical Troubleshooting Chart if component (hose or gun) is not heating.

A4. Check input air pressure to guns at the filter/regulator gauge.

NORMAL INDICATION:	ABNORMAL INDICATION:
30 to 100 psi (205 to 690 kPa). Proceed to next step.	Refer to appropriate gun service manual for troubleshooting procedure and corrective action. The fault may be in the regulator, solenoid valve, or gun.

A5. Check guns not firing due to clogged nozzles in the following manner:

a. Reduce air pressure to guns to zero at the regulator.

b. Remove a nozzle from each gun.

c. Reset gun air pressure to proper pressure.

d. Momentarily trigger guns and check for flow.

NORMAL INDICATION:	ABNORMAL INDICATION:
Material extrudes from guns with nozzles removed. Remove and clean nozzles. Restore system to normal operation.	Refer to appropriate gun service manual for troubleshooting procedure and corrective action. Continue to next step if blockage is not hose or gun related.

A6. Secure input air pressure and crack open manifold drain valve to relieve system pressure.

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TABLE 2 - TROUBLESHOOTING CHART - MECHANICAL (Continued)

Failure to relieve system pressure can result in serious burns when manifold components are removed for maintenance.

A7. Remove manifold heat exchanger and check for blockage.

NORMAL INDICATION: Heat exchanger passages free of char or adhesive buildup. Replace heat exchanger and proceed to next step.

ABNORMAL INDICATION: Heat exchanger passages clogged with char and adhesive buildup. Clean and reinstall heat exchanger. Restore system to normal operation.

A8. Remove manifold adhesive filter and check for blockage.

NORMAL INDICATION: Filter screen free of char and particle buildup. Reinstall filter and continue to next step.

ABNORMAL INDICATION: Filter screen clogged with char and particle buildup. Clean filter and reinstall. Restore system to normal operation.

A9. Check input air pressure to air cylinder (motor) at the gauge.

NORMAL INDICATION: 5 to 80 psi (35 to 550 kPa). Proceed to next step.

ABNORMAL INDICATION: Improper pressure indication. Check input air supply.

A10. Check pressure regulator and solenoid valve to air cylinder (motor) in the following manner:

a. Set regulator for zero pressure by turning dial full counterclockwise.

b. Shut off air supply to regulator.

c. Disconnect regulator and solenoid valve from air cylinder (motor) at the hose connection on regulator.

d. Restore air supply to regulator.

e. Check main circuit breaker ON (closed).

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TABLE 2 - TROUBLESHOOTING CHART - MECHANICAL (Continued)

f. Slowly increase air pressure at the regulator by turning dial clockwise.

NORMAL INDICATION:	ABNORMAL INDICATION:
Gradually increasing audible noise from regulator. Restore system to normal. Continue to step A11 if unit has an air cylinder. Proceed to step A16 if the unit has an air motor.	Continue to next step if no air issues from regulator when regulator is opened. Set regulator to zero pressure and secure input air to solenoid valve.

g. Remove regulator from solenoid valve at the male pipe union.

h. Slowly restore input air pressure to solenoid valve.

NORMAL INDICATION:	ABNORMAL INDICATION:
Gradually increasing audible noise from solenoid valve. Replace faulty regulator. Restore system to normal operation.	Replace solenoid valve if no air issues. Restore system to normal operation.

NOTE: Air cylinder malfunctions may be caused by seal leakage or mechanical failure. Proceed with fault isolation in the following manner:

A11. Set pump air pressure to 30 psi (205 kPa) and check for air leakage.

NORMAL INDICATION:	ABNORMAL INDICATION:
No air leakage apparent. Proceed to next step.	Seal leakage. Use the following table to determine failed seal. Nordson recommends that all seals be replaced when the cylinder is disassembled.

NOTE: Improper adjustment of the trip collar and valve shifter may cause air leakage and improper pump operation because the spool in the air control valve does not shift completely when the air piston reaches the end of its stroke. Check this by pushing the valve shifter in the direction it is supposed to be traveling. If the shifter moves and leakage stops, the shifter must be adjusted. If the shifter does not move and leakage continues, air leakage is due to a failed seal or gasket. Also check for worn bearings in control arm bracket.

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TABLE 2 - TROUBLESHOOTING CHART - MECHANICAL (Continued)

With Piston on Up Stroke

Air Leakage Location:	Probable Failed Seal:
a. Around shaft inside pump mount.	U-cup pump mount
b. Top exhaust port (poppet open).	Lower piston cup or upper poppet
c. Bottom exhaust port (poppet closed).	Lower poppet seal washer
d. Bottom of cylinder.	Pump mount slab gasket
e. Between air valve and pump mount.	Lower valve gasket

With Piston on Down Stroke

Air Leakage Location:	Probable Failed Seal:
a. Bottom exhaust port (poppet open).	Upper piston cup or lower poppet
b. Top exhaust port (poppet closed).	Upper poppet seal washer
c. Top of cylinder.	Cylinder head slab gasket
d. Between air valve and cylinder head.	Upper valve gasket

A12. Visually inspect four-way air control valve actuating rod for binding or physical damage.

NORMAL INDICATION: Actuating rod straight with no evidence of binding. Proceed to next step.

ABNORMAL INDICATION: Actuating rod damaged or there is evidence of binding. Replace actuating rod. Restore system to normal operation.

A13. Visually inspect valve shifter and trip collar for proper lubrication and evidence of binding or physical damage.

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TABLE 2 - TROUBLESHOOTING CHART - MECHANICAL (Continued)

NORMAL INDICATION: Valve shifter and trip collar properly installed and lubricated. No evidence of binding or physical damage. Proceed to next step.

ABNORMAL INDICATION: Valve shifter and/or trip collar damaged or binding. Replace damaged parts. Restore system to normal operation.

A14. Remove and disassemble four-way air control valve. Check for binding and physical damage.

NORMAL INDICATION: No binding or physical damage. Reinstall valve on air cylinder. Proceed to next step.

ABNORMAL INDICATION: Evidence of binding and physical damage to internal valve parts. Replace damaged parts. Restore system to normal operation.

A15. Air piston failure is usually indicated by the pump stalling in an extreme position at one end of the stroke or the other. Check this condition by manually shifting the four-way air control valve with air pressure applied from the regulator.

NORMAL INDICATION: Air piston makes one stroke and stops. Disassemble air cylinder and replace damaged or binding parts. Restore system to normal operation.

ABNORMAL INDICATION: Air piston does not stroke. Disassemble hydraulic cylinder and replace damaged or binding parts. Restore system to normal operation.

A16. Reduce system pressure to zero by securing air pressure to the pump, triggering all guns to relieve trapped hydraulic pressure, and opening manifold drain valve.

A17. Disconnect air line from control valve. Remove gear pump assembly from applicator tank. Reconnect air line to control valve.

A18. Remove gear pump from pump assembly at the drive coupling.

A19. Check air motor and speed reducer for free rotation by applying air pressure to air motor.

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TABLE 2 - TROUBLESHOOTING CHART - MECHANICAL (Continued)

NORMAL INDICATION: Air motor and speed reducer turn smoothly. Rebuild or replace gear pump. Restore system to normal operation.	ABNORMAL INDICATION: Air motor and speed reducer do not turn smoothly with air applied. Proceed to next step.

A20. Remove air motor from speed reducer at the coupling.

A21. Check air motor for proper operation by applying air pressure to the air motor.

NORMAL INDICATION: Air motor turns freely with air applied. Replace speed reducer. Restore system to normal operation.	ABNORMAL INDICATION: Air motor does not turn freely. Replace air motor. Restore system to normal operation.

AIR MOTOR STROKING (Piston Pump) OR ROTATING (Gear Pump) TOO FAST

B1. Check adhesive tank for sufficient melting. Inner tank lid cannot be removed until adhesive in tank is molten.

NORMAL INDICATION: Adhesive in molten state and tank at least one-half full of adhesive. Proceed to next step.	ABNORMAL INDICATION: Increase tank temperature setting and/or add fresh adhesive to tank. If tank is not heating, refer to Electrical Troubleshooting Chart for procedure and corrective action.

B2. Relieve system pressure by reducing pump air pressure to zero at the regulator, momentarily triggering all guns, and opening manifold drain valve.

B3. Remove pressure relief valve and check for char or foreign material on seat.

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TABLE 2 - TROUBLESHOOTING CHART - MECHANICAL (Continued)

NORMAL INDICATION: Relief valve operates freely with no char or foreign material in valve. Reinstall valve and proceed to next step if unit is equipped with an air cylinder. Proceed to step B5 if the unit is equipped with an air motor.

ABNORMAL INDICATION: Char or foreign material on valve seat. Replace relief valve. Reinstall valve and restore system to normal operation.

B4. Remove piston pump assembly from applicator and disassemble hydraulic cylinder. Check for char or foreign material holding pressure ball off its seat. Check also for other physical damage.

NORMAL INDICATION: No foreign particles in cylinder. No physical damage. Disassemble air cylinder and check for damage. Repair as necessary. Restore system to normal operation.

ABNORMAL INDICATION: If char or foreign particles are found in hydraulic cylinder, disassemble and clean components. Reassemble and restore system to normal operation.

B5. Remove pressure control valve from gear pump assembly. Check for char and foreign material holding spool in full-open position.

NORMAL INDICATION: Valve is free of char and foreign material. Disassemble gear pump assembly and check for physical damage. Reassemble and restore system to normal operation.

ABNORMAL INDICATION: Char and foreign material inside valve body. Clean valve components and reinstall in gear pump drive assembly. Restore system to normal operation.

AIR MOTOR STROKING (Piston Pump) OR ROTATING (Gear Pump) ERRATICALLY

NOTE: Erratic stroking of the piston pump is indicated by two exhaust sounds close together followed by a pause (double stroking). This results because the piston is moving faster in one direction than the other. Erratic operation of the gear pump is indicated by a change in pitch (noise level) of the air exiting the air motor.

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TABLE 2 - TROUBLESHOOTING CHART - MECHANICAL (Continued)

C1. Check adhesive tank for sufficient melting. Inner tank lid cannot be removed until adhesive around tank lid is molten.

NORMAL INDICATION: Adhesive in molten state and tank at least one-half full of adhesive. Proceed to next step if the unit is equipped with an air cylinder. Proceed to step C4 if the unit is equipped with a rotary air motor.

ABNORMAL INDICATON: Increase tank temperature setting and/or add fresh adhesive to tank. If tank is not heating, refer to Electrical Troubleshooting Chart for procedure and corrective action.

C2. A foreign particle that prevents material from flowing past the siphon ball seat may cause erratic pump stroking. Attempt to dislodge the particle by increasing and decreasing pump air pressure while holding guns open.

NORMAL INDICATION: Particle is freed and pump strokes normally. Readjust air pressure to normal level.

ABNORMAL INDICATION: Piston pump continues to stroke erratically. Proceed to next step.

C3. Remove pump assembly from applicator and inspect for foreign particle holding siphon ball off its seat. Attempt to clear seat area.

NORMAL INDICATION: Seat area is cleared of foreign material. Reassemble pump drive unit into applicator. Restore system to normal operation.

ABNORMAL INDICATION: Seat area cannot be cleared or shows no indication of clogging. Disassemble hydraulic cylinder and inspect for foreign material holding pressure ball off its seat. Reassemble pump drive unit into applicator and restore system to normal operation.

C4. Check input air pressure to rotary air motor.

NORMAL INDICATION: Input air pressure should be low enough so that air motor runs slowly when guns are not firing. Proceed to next step.

ABNORMAL INDICATION: Reduce input air pressure at the regulator.

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TABLE 2 - TROUBLESHOOTING CHART - MECHANICAL (Continued)

C5. Relieve system pressure by reducing pump air pressure to zero at the regulator, momentarily triggering all guns, and opening manifold drain valve.

C6. Remove pressure control valve from gear pump drive assembly and check for char or foreign material holding spool in full-open position.

NORMAL INDICATION: Valve is free of char and foreign material. Disassemble pump drive assembly and check for physical damage. Reassemble and restore system to normal operation.

ABNORMAL INDICATION: Char and foreign material inside valve body. Clean valve components and reinstall in gear pump drive assembly. Restore system to normal operation.

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TABLE 3 - TROUBLESHOOTING CHART - ELECTRICAL SUMMARY

Electrical troubleshooting the Series 2000 hot melt applicators may be simplified by noting temperature control panel indicators and the position of the main circuit breaker. Light emitting diodes (LED's) indicate whether heaters are energized and if a fault has developed in the solid-state circuitry or the resistance temperature detectors (RTD's). If the main circuit breaker has tripped, an overtemperature condition or circuit failure is indicated. Time delay circuitry in the temperature controller allows sufficient time to make observations and checks before the main circuit breaker trips open. This delay occurs because of the time required to heat the resistor enough to close the thermal contacts. Likewise, a delay of up to 15 minutes exists before the circuit breaker can be reclosed because the resistor must cool down enough to allow the thermal contacts to open.

If possible, a starting condition should be established to enable determination of a fault condition. The applicator should be at normal operating temperature. The main circuit breaker should be ON (closed). Air pressure to the air motor and extrusion guns should be at normal settings.

The following chart indicates the condition of the LED's during normal and fault situations.

SITUATION	YELLOW LED	RED LED
Tank or hose heating. (NORMAL)	ON	OFF
Tank or hose at temperature. (NORMAL)	FLASHING	OFF
Tank or hose slightly above application temperature. (NORMAL)	OFF	OFF
Tank or hose overheating (Halfway between set point and 500°F). (FAULT)	OFF	ON
RTD sensor shorted. (FAULT)	ON	ON
RTD sensor open. (FAULT)	OFF	ON

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TABLE 3 - TROUBLESHOOTING CHART - ELECTRICAL SUMMARY (Continued)

FAULT CONDITION	PROBABLE CAUSE	REF
TANK FAILS TO HEAT OR UNDERHEATS	Loose connections or exposed wiring.	A3
	Defective tank close-on-rise thermostat.	A5
	Defective thermal relay.	A6
	Defective CB1 trip mechanism.	A7
	Improper input voltage.	A9
	Defective main circuit breaker.	A10
	Defective tank/hose circuit breaker.	A12
	Defective temperature control board.	A13
	Defective solid-state relay (SSR).	A14
	Defective tank heaters.	A14
	Defective tank RTD.	A16
TANK OVERHEATS ABOVE 500°F (260°C)	Faulty main circuit breaker auxiliary trip coil.	B1
	Failed tank thermostat (THS_T).	B1
TANK OVERHEATS TO POINT WHERE MAIN CIRCUIT BREAKER OPENS	Defective tank RTD.	C2
	Defective temperature controller.	C2
	Defective solid-state relay.	C4
HOSE FAILS TO HEAT OR UNDERHEATS	Loose connection or exposed wiring.	D3
	Defective tank thermostat (THS_T).	D5

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TABLE 3 - TROUBLESHOOTING CHART - ELECTRICAL SUMMARY (Continued)

FAULT CONDITION	PROBABLE CAUSE	REF
HOSE FAILS TO HEAT OR UNDERHEATS (Continued)	Defective thermal relay.	D6
	Defective CB1 trip mechanism.	D7
	Improper input voltage.	D9
	Defective main circuit breaker.	D10
	Defective tank/hose circuit breaker.	D12
	Defective temperature control board.	D12
	Defective hose heater.	D13
	Defective hose RTD.	D15
HOSE OVERHEATS	Defective hose RTD.	E2
	Defective hose temperature controller.	E2
GUN FAILS TO HEAT OR UNDERHEATS	Improper input voltage.	F1
	Defective main circuit breaker.	F2
	Defective gun circuit breaker.	F4
	Defective cartridge heater.	F5
	Defective gun thermostat.	F5
GUN OVERHEATS	Defective gun thermostat.	G1

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TABLE 4 - TROUBLESHOOTING CHART - ELECTRICAL

The Series 2000 hot melt applicators and associated hoses and guns contain energized electrical components with potentials that could be fatal. Only qualified personnel shall operate and perform maintenance on this equipment.

Wear safety glasses, safety gloves (P/N 902 514), and protective clothing to prevent injury from hot applicator parts, splashed hot melt adhesive material, and hot gun surfaces.

Review the Safety Summary, 40-1, at the front of this service manual before attempting to perform maintenance on this equipment.

TANK FAILS TO HEAT OR UNDERHEATS

A1. Check the position of the main circuit breaker (CB1).

NORMAL INDICATION: Main circuit breaker ON. Proceed to step A8.

ABNORMAL INDICATION: Main circuit breaker OFF. Proceed to next step.

A2. Attempt to close main circuit breaker.

NORMAL INDICATION: Main circuit breaker ON. Proceed to step A8.

ABNORMAL INDICATION: Main circuit breaker trips immediately. Proceed to next step.

A3. Disconnect and lock out input electrical power to the applicator.

Input terminal block TB1 and input terminals on main circuit breaker are still electrically energized if external power is not disconnected, even though the main circuit breaker is OFF. Failure to disconnect and lock out input electrical power could result in electrical shock or equipment damage.

A4. Remove the upper electrical enclosure and check for loose connections or exposed wiring on all terminal blocks and temperature control components. (VISUAL INSPECTION)

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TABLE 4 - TROUBLESHOOTING CHART - ELECTRICAL (Continued)

NORMAL INDICATION: All wiring connections tight with no broken or exposed wiring. Proceed to next step.	ABNORMAL INDICATION: Tighten loose connections and/or replace faulty wiring. Restore system to normal operation.

A5. Disconnect either wire No. 47 (35) or 48 (36) (tank thermostat) at TB2-7 or TB2-2 and measure resistance across tank thermostat (between wire Nos. 47 (35) and 48 (36)). Wire numbers in parenthesis ( ) are for the 2002/2202.

NORMAL INDICATION: Open circuit when tank wall temperature is below 500°F (260°C). Proceed to next step.	ABNORMAL INDICATION: Continuity when tank wall temperature is below 500°F (260°C). Replace thermostat and restore system to normal operation.

A6. Remove 2-pin connector J3 (wire Nos. 30 and 40) on temperature control board and check continuity across the two pins on board (J1-3 and J1-4).

NORMAL INDICATION: Open circuit after thermal relay is cooled down (approximately 15 minutes). Proceed to next step.	ABNORMAL INDICATION: Short circuit. Wait 15 minutes for unit to cool down. Measure again. If still shorted, replace thermal relay. Restore system to normal operation.

A7. Attempt to close main circuit breaker.

NORMAL INDICATION: Main circuit breaker remains ON. Proceed to step A8.	ABNORMAL INDICATION: Main circuit breaker continues to trip. Replace circuit breaker due to faulty trip mechanism. Restore system to normal operation.

A8. Restore input electrical power to applicator and note the condition of the red and yellow indicating lights on the temperature control panel. Proceed to the appropriate point in the Electrical Troubleshooting Chart if the problem is hose related.

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TABLE 4 - TROUBLESHOOTING CHART - ELECTRICAL (Continued)

NORMAL INDICATION: Yellow LED on and red LED off indicating the tank should be heating. Proceed to step A13.

ABNORMAL INDICATION: If both LED's are off, power to the TTC has been lost or the TTC has failed. Proceed to next step. If both LED's are on or the yellow LED is off and the red LED is on, the problem is in the TTC or sensor. Proceed to step A16.

A9. Check input voltage at terminal block TB1.

NORMAL INDICATION: Voltage as indicated in the below table. Proceed to the next step.

ABNORMAL INDICATION: Unequal or no voltage measured. Check input voltage source.

230 VAC, Single-Phase Input: 180 to 256 VAC between terminals 1 and 2 on TB1.

230 VAC, Three-Phase Input: 180 to 256 VAC between terminals 1 and 2, 2 and 3, and 1 and 3 on TB1.

380 VAC, Three-Phase Input (4 wire): Approximately 220 VAC between terminals 1 and 4, 2 and 4, and 3 and 4 on TB1.

A10. Disconnect and lock out input electrical power to the applicator.

Input terminal block TB1 and input terminals on main circuit breaker are still electrically energized if external power is not disconnected, even though the main circuit breaker is OFF. Failure to disconnect and lock out input electrical power could result in electrical shock or equipment damage.

A11. Using an ohmmeter on the lowest resistance scale (R x 1), check continuity between the following points:

TB1-1 and TB2-4
TB1-2 and TB2-1
TB1-3 and TB2-6

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TABLE 4 - TROUBLESHOOTING CHART - ELECTRICAL (Continued)

NORMAL INDICATION: Continuity at each point. Proceed to next step.

ABNORMAL INDICATION: If any one of the readings is anything but continuity, one portion of the main circuit breaker is open. Replace circuit breaker and restore system to normal operation.

A12. With external power still disconnected, remove plug J1 from temperature control board and measure resistance between TB2-5 and J1-6.

NORMAL INDICATION: Continuity. Replace temperature control board (TTC). Restore system to normal operation.

ABNORMAL INDICATION: Open circuit. Attempt to reset hose/tank circuit breaker using button on front panel. Replace CBH if the breaker will not reset. Restore system to normal operation.

A13. Measure the dc voltage across wire No. 44(+) (32) and wire No. 43(-) (31) on the solid-state relay (SSR).

NORMAL INDICATION: 12 Vdc. Proceed to next step.

ABNORMAL INDICATION: 0 Vdc. Replace temperature control board. Restore system to normal operation.

A14. Disconnect and lock out input electrical power to the applicator.

Input terminal block TB1 and input terminals on main circuit breaker are still electrically energized if external power is not disconnected, even though the main circuit breaker is OFF. Failure to disconnect and lock out input electrical power could result in electrical shock or equipment damage.

A15. Disconnect wire No. 51 (39) from TB2-2 and measure the tank heater resistance between wire No. 51 (39) and wire No. 50 (38) on the solid-state relay.

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TABLE 4 - TROUBLESHOOTING CHART - ELECTRICAL (Continued)

NORMAL INDICATION: 16.9 to 19.8 ohms for the 2002/2004 and 13.1 to 15.2 ohms for the 2200/2202. Replace solid-state relay. Reconnect wire No. 51 (39) and restore system to normal operation.

ABNORMAL INDICATION: Open circuit or high resistance. Replace tank. Reconnect wire No. 51 (39) and restore system to normal operation.

A16. Disconnect and lock out input electrical power to the applicator.

Input terminal board TB1 and input terminals on main circuit breaker are still electrically energized if external power is not disconnected, even though the main circuit breaker is OFF. Failure to disconnect and lock out input electrical power could result in electrical shock or equipment damage.

A17. Unplug J2 from the temperature control board and measure the resistance across the tank RTD between pins 2 and 5 on the plug.

NORMAL INDICATION: The RTD is calibrated in the range from 120 to 320 ohms. If resistance is within acceptable tolerance, replace temperature control board. Restore system to normal operation.

ABNORMAL INDICATION: If RTD resistance is outside the range from 120 to 320 ohms (open or shorted), replace the RTD. Restore system to normal operation.

TANK OVERHEATS ABOVE 500°F (260°C)

On an overtemperature condition where tank temperature rises above 500°F (260°C), the close-on-rise thermostat (THS_T) should open the main circuit breaker through the circuit breaker auxiliary trip coil. If the main circuit breaker does not open, proceed in the following manner.

B1. Disconnect and lock out input electrical power to the applicator.

Input terminal block TB1 and input terminals on main circuit breaker are still electrically energized if external power is not disconnected, even though the main circuit breaker is OFF (open).

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TABLE 4 - TROUBLESHOOTING CHART - ELECTRICAL (Continued)

B2. Disconnect wire Nos. 47 (35) and 48 (36) from TB2-7 and TB2-2. Measure the resistance across the tank thermostat with tank in hot condition.

NORMAL INDICATION: Short circuit when tank is above 500°F. Replace main circuit breaker. Proceed to next step.

ABNORMAL INDICATION: Open circuit when tank is above 500°F. Replace thermostat (THS_T). Proceed to next step.

NOTE: Even though the main circuit breaker auxiliary trip coil or thermostat indicated defective, a fault still remains in the tank temperature control circuitry that allowed temperature to increase above normal control band. Continue the troubleshooting sequence to isolate and correct the fault.

TANK OVERHEATS TO THE POINT WHERE THERMOSTAT OPENS MAIN CIRCUIT BREAKER

An overheating condition in the tank will be indicated by a red LED on the tank temperature controller when temperature on the tank wall reaches halfway between the temperature setting on the controller and 500°F (260°C). Approximately two minutes later, the temperature controller will open the main circuit breaker through the circuit breaker auxiliary trip coil.

C1. With the main circuit breaker closed, check the condition of the temperature controller indicators. Refer to Table 3 for indications.

NOTE: It may be necessary to wait as long as 15 minutes for the thermal relay contacts to open before the main circuit breaker can be reclosed.

NORMAL INDICATION: With temperature above the set point but below the halfway point between the set point and 500°F, both LED's should be dark. Above the halfway point, the red LED should be lit for approximately two minutes until the main circuit breaker trips. Proceed to step C4.

ABNORMAL INDICATION: If both the red and yellow LED's are lit, proceed to the next step.

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TABLE 4 - TROUBLESHOOTING CHART - ELECTRICAL (Continued)

C2. Disconnect and lock out input electrical power to the applicator.

Input terminal block TB1 and input terminals on main circuit breaker are still electrically energized if external power is not disconnected, even though the main circuit breaker is OFF (open).

C3. Unplug J2 from the temperature control board and measure the resistance across the tank RTD between pins 2 and 5 on the plug.

NORMAL INDICATION: Resistance value within the range specified in step A17. Replace temperature control board and restore system to normal operation.

ABNORMAL INDICATION: Short circuit or resistance well below the range specified in step A17. Replace RTD and restore system to normal operation.

C4. Measure the dc voltage across wire Nos. 44(+) (32) and 43(-) (31) on the solid-state relay (SSR). Wire numbers in parenthesis ( ) are for the 2002/2202.

NOTE: Set tank temperature control to minimum setting.

NORMAL INDICATION: 0 Vdc. Replace solid-state relay. Restore system to normal operation.

ABNORMAL INDICATION: 12 Vdc. Replace temperature controller. Restore system to normal operation.

HOSE FAILS TO HEAT OR UNDERHEATS

D1. Check the position of the main circuit breaker (CB1).

NORMAL INDICATION: Main circuit breaker ON. Proceed to step D8.

ABNORMAL INDICATION: Main circuit breaker OFF. Proceed to next step.

D2. Attempt to close main circuit breaker.

NORMAL INDICATION: Main circuit breaker ON. Proceed to step D8.

ABNORMAL INDICATION: Main circuit breaker trips immediately. Proceed to next step.

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TABLE 4 - TROUBLESHOOTING CHART - ELECTRICAL (Continued)

D3. Disconnect and lock out input electrical power to the applicator.

Input terminal block TB1 and input terminals on main circuit breaker are still electrically energized if external power is not disconnected, even though the main circuit breaker is OFF. Failure to disconnect and lock out input electrical power could result in electrical shock or equipment damage.

D4. Remove the upper electrical enclosure and check for loose connections or exposed wiring on all terminal blocks and temperature control components. (VISUAL INSPECTION)

NORMAL INDICATION: All wiring connections tight with no broken or exposed wiring. Proceed to next step.

ABNORMAL INDICATION: Tighten loose connections and/or replace faulty wiring. Restore system to normal operation.

D5. Disconnect either wire No. 47 (35) or 48 (36) (tank thermostat) at TB2-7 or TB2-2 and measure resistance across tank thermostat. Wire numbers in parenthesis ( ) are for the 2002/2202.

NORMAL INDICATION: Open circuit when tank wall temperature is below 500°F (260°C). Proceed to next step.

ABNORMAL INDICATION: Short circuit. Replace thermostat and restore system to normal operation.

D6. Remove 2-pin connector J3 (disconnect wire Nos. 30 and 40) on temperature control board and check continuity across the two pins on board.

NORMAL INDICATION: Open circuit after thermal relay is cooled down (approximately 15 minutes). Proceed to next step.

ABNORMAL INDICATION: Short circuit. Wait 15 minutes for unit to cool down. Measure again. If still shorted, replace thermal relay. Restore system to normal operation.

D7. Attempt to close main circuit breaker.

NORMAL INDICATION: Main circuit breaker remains ON. Proceed to next step.

ABNORMAL INDICATION: Main circuit breaker continues to trip. Replace circuit breaker due to faulty trip mechanism. Restore system to normal operation.

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TABLE 4 - TROUBLESHOOTING CHART - ELECTRICAL (Continued)

D8. Restore input electrical power to applicator and note the condition of red and yellow indicating lights on the temperature control panel. Proceed to the appropriate point in the Electrical Troubleshooting Chart if problem is tank related.

NORMAL INDICATION: Yellow LED on and red LED off indicating the hose should be heating. Proceed to step D13.

ABNORMAL INDICATION: If both LED's are off, power to the HTC has been lost or the HTC has failed. Proceed to the next step. If both LED's are on or the yellow LED is off and the red LED is on, the problem is in the HTC or sensor. Proceed to step D15.

D9. Check input voltage at terminal block TB1.

NORMAL INDICATION: Voltage as indicated in the below table. Proceed to next step.

ABNORMAL INDICATION: Unequal or no voltage. Check input voltage source.

230 VAC, Single-Phase Input:	180 to 240 VAC between terminals 1 and 2 on TB1.
230 VAC, Three-Phase Input:	180 to 240 VAC between terminals 1 and 2, 2 and 3, and 1 and 3 on TB1.
380 VAC, Three-Phase Input (4 wire):	Approximately 220 VAC between terminals 1 and 4, 2 and 4, and 3 and 4 on TB1.

D10. Disconnect and lock out input electrical power to the applicator.

Input terminal block TB1 and input terminals on main circuit breaker are electrically energized if external power is not disconnected, even though the main circuit breaker is OFF. Failure to disconnect and lock out input electrical power could result in electrical shock or equipment damage.

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TABLE 4 - TROUBLESHOOTING CHART - ELECTRICAL (Continued)

D11. Using an ohmmeter on the lowest resistance scale (R x 1), check continuity between the following points:

TB1-1 and TB2-4
TB1-2 and TB2-1
TB1-3 and TB2-6

NORMAL INDICATION: Continuity at each point. Proceed to next step.

ABNORMAL INDICATION: If any one of the readings is anything but continuity, one portion of the main circuit breaker is open. Replace circuit breaker and restore system to normal operation.

D12. With external power still disconnected, remove plug J1 from temperature control board and measure resistance between TB2-5 and J1-6.

NORMAL INDICATION: Continuity. Replace temperature control board. Restore system to normal operation.

ABNORMAL INDICATION: Open circuit. Attempt to reset hose/tank circuit breaker using button on front panel. Replace CBH if the breaker will not reset. Restore system to normal operation.

D13. Disconnect and lock out input electrical power to the applicator.

Input terminal block TB1 and input terminals on main circuit breaker are still electrically energized if external power is not disconnected, even though the main circuit breaker is OFF. Failure to disconnect and lock out input electrical power could result in electrical shock or equipment damage.

D14. Disconnect the hose electrical connector from the applicator and measure hose heater resistance at pins 1 and 2 on the plug.

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TABLE 4 - TROUBLESHOOTING CHART - ELECTRICAL (Continued)

NORMAL INDICATION: Hose heater resistance within the range specified in the below chart. Attach the connector and restore system to normal operation.

ABNORMAL INDICATION: Resistance outside the range specified in the below chart. Replace the hose and restore system to normal operation.

Part No.	Hose Type	Hose Length	Cold Ohms Resistance
272 863	Automatic	2 ft (0.6 m)	245 - 270
272 838	Automatic	4 ft (1.2 m)	489 - 541
272 839	Automatic	6 ft (1.8 m)	326 - 360
272 840	Automatic	8 ft (2.4 m)	245 - 270
272 841	Automatic	10 ft (3.1 m)	196 - 216
273 624	Automatic	16 ft (4.9 m)	122 - 135
273 204	Handgun	8 ft (2.4 m)	245 - 270
273 205	Handgun	16 ft (4.9 m)	122 - 135

D15. Disconnect and lock out input electrical power to the applicator.

Input terminal block TB1 and input terminals on main circuit breaker are still electrically energized if external power is not disconnected, even though the main circuit breaker is OFF. Failure to disconnect and lock out input electrical power could result in electrical shock or equipment damage.

D16. Disconnect the 9-pin connector (J2) on the temperature control board and measure the resistance of the hose RTD on the plug pins noted below:

Hose No. 1: pin 1 to pin 9
Hose No. 2: pin 1 to pin 7
Hose No. 3: pin 1 to pin 8
Hose No. 4: pin 1 to pin 4

NORMAL INDICATION: The hose RTD is calibrated in the range from 120 to 320 ohms. If resistance is within acceptable tolerance, replace the temperature control board. Restore system to normal operations.

ABNORMAL INDICATION: If the RTD resistance is outside the range from 120 to 320 ohms (open or shorted), proceed to next step.

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TABLE 4 - TROUBLESHOOTING CHART - ELECTRICAL (Continued)

D17. Disconnect the hose electrical connector from the applicator and measure hose RTD resistance at pins 3 and 4 on the plug.

NORMAL INDICATION: 120 to 320 ohms. Locate and replace faulty wiring. Restore system to normal operation.

ABNORMAL INDICATION: Resistance outside the range from 120 to 320 ohms (open or shorted). Replace hose and restore system to normal operation.

HOSE OVERHEATS

An overheating condition in the hose will be indicated by a red LED on the hose temperature control panel when temperature in the hose reaches a point halfway between the temperature setting on the controller and 500°F (260°C). Approximately two minutes later, the temperature controller will open the main circuit breaker through the circuit breaker auxiliary trip coil.

E1. With the main circuit breaker closed, check the condition of the temperature control indicators for that hose. Refer to Table 3 for indications.

NOTE: It may be necessary to wait as long as 15 minutes for the thermal relay contacts to open up before the main circuit breaker can be reclosed.

NORMAL INDICATION: With temperature above the set point but below the halfway point, both LED's should be dark. Above the halfway point, the red LED should be lit for approximately two minutes until the main circuit breaker trips.

ABNORMAL INDICATION: If both the red and yellow LED's are lit, proceed to the next step.

E2. Disconnect and lock out input electrical power to the applicator.

Input terminal block TB1 and input terminals on main circuit breaker are still electrically energized if external power is not disconnected, even though the main circuit breaker is OFF (open).

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TABLE 4 - TROUBLESHOOTING CHART - ELECTRICAL (Continued)

E3. Remove the hose electrical connector for the affected hose and measure the RTD resistance on pins 3 and 4 of the hose-end connector.

NORMAL INDICATION: Resistance value within the range specified in step D16. Replace temperature control board. Restore system to normal operation.

ABNORMAL INDICATION: Short circuit or resistance well below range specified in step D16. Replace hose. Reconnect hose connector and restore system to normal operation.

GUN FAILS TO HEAT OR UNDERHEATS

F1. Check input voltage at TB1.

NORMAL INDICATION: Voltage as indicated in the below table. Proceed to next step.

ABNORMAL INDICATION: Unequal or no voltage. Check input voltage source.

230 VAC, Single-Phase Input:	180 to 256 VAC between terminals 1 and 2 on TB1.
230 VAC, Three-Phase Input:	180 to 256 VAC between terminals 1 and 2, 2 and 3, and 1 and 3 on TB1.
380 VAC, Three-Phase Input (4 wire):	Approximately 220 VAC between terminals 1 and 4, 2 and 4, and 3 and 4 on TB1.

F2. Disconnect and lock out input electrical power to the applicator.

Input terminal block TB1 and input terminals on main circuit breaker are still electrically energized if external power is not disconnected, even though the main circuit breaker is OFF. Failure to disconnect and lock out input electrical power could result in electrical shock or equipment damage.

F3. Using an ohmmeter on the lowest resistance scale (R x 1), check continuity between the following points:

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TABLE 4 - TROUBLESHOOTING CHART - ELECTRICAL (Continued)

TB1-1 and TB2-4
TB1-2 and TB2-1
TB1-3 and TB2-6

NORMAL INDICATION: Continuity at each point. Proceed to next step.

ABNORMAL INDICATION: If any one of the readings is anything but continuity, one portion of the main circuit breaker is open. Replace circuit breaker and restore system to normal operation.

F4. With external power still disconnected, remove plug J1 from temperature control board and measure resistance between TB2-5 and J1-6.

NORMAL INDICATION: Continuity. Proceed to next step.

ABNORMAL INDICATION: Open circuit. Attempt to reset gun circuit breaker using button on front panel. Replace CBG if the breaker will not reset. Restore system to normal operation.

F5. Measure the resistance of the cartridge heater and thermostat between pins 2 and 7 on the plug side of the hose electrical connector for the affected gun.

NORMAL INDICATION: Cartridge heater resistance in accordance with the appropriate gun service manual. Restore system to normal operation.

ABNORMAL INDICATION: Open circuit. Proceed to next step.

F6. Remove gun service cover and disconnect thermostat leads at the wire nuts. Measure resistance between thermostat leads.

NORMAL INDICATION: Continuity. Replace cartridge heater. Reconnect thermostat leads and restore system to normal operation.

ABNORMAL INDICATION: Open circuit. Replace thermostat. Reconnect thermostat leads and restore system to normal operation.

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TABLE 4 - TROUBLESHOOTING CHART - ELECTRICAL (Continued)

GUN OVERHEATS

G1. Disconnect and lock out input electrical power to the applicator.

Failure to disconnect input electrical power to the applicator can result in severe electrical shock when the gun cover is removed.

G2. Remove gun service block cover and disconnect thermostat leads at the wire nuts. Measure the resistance across thermostat leads.

NORMAL INDICATION: Open circuit. Reconnect thermostat leads and restore system to normal operation.

ABNORMAL INDICATION: Continuity. Replace thermostat and restore system to normal operation.

NOTE: If the thermostat operates properly, the rating of the thermostat may be too hot for the adhesive being used. Consult adhesive manufacturer for proper application temperature. Replace thermostat with a lower temperature unit if necessary.

DISASSEMBLY AND REPAIR

The Series 2000 hot melt applicators contain energized electrical components with potentials that could be fatal. Disconnect and lock out input electrical power to the applicator before removing any panels or performing maintenance procedures.

Do not attempt to loosen any part of manifold, hoses, or guns until air to the applicator has been turned off and pressure in the system has been relieved.

Wear safety glasses, safety gloves (P/N 902 514), and protective clothing to prevent injury from hot applicator parts, splashed hot melt adhesive material, and hot gun surfaces.

If applicator is operable, flush system before disassembly. If pump is not operable, but the heating system is functional, heat the applicator to operating temperature to ease disassembly. Otherwise, a heat gun or other flameless heating method must be used to melt solidified hot melt adhesive material on components.

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Never heat any component with a torch or other open flame. Use an electric oven with forced air circulation or a flameless electric heat gun.

AIR OPERATED PISTON PUMP DISASSEMBLY (Figure 14)

1. Remove upper tank enclosure housing by removing one captive screw.

The captive screw is at tank temperature. Wear safety gloves (P/N 902 514) to prevent serious burns.

2. Set regulator air pressure to zero. Open main circuit breaker.

3. Remove air hose from air motor control valve (34).

4. Remove three screws and lockwashers anchoring pump to applicator unit.

5. Pull pump straight up to disengage connecting tube from manifold.

6. Remove four-way air valve (34) from air motor by removing four screws (35) and lockwashers (3) on side of control valve.

7. Remove four screws (2) and lockwashers (3) from cylinder head (4).

8. Remove cylinder head (4) and cylinder (6) from air pump.

9. Check slab gaskets (5) at top and bottom of cylinder. Replace gaskets if damaged.

10. Hold piston shaft with a wrench and remove piston locknut (7).

11. Remove piston cup washers (8), piston seal washer (9), and piston cups (10) from piston shaft.

12. Inspect cups and seals for damage. Replace as necessary.

13. Remove two set screws (13) from trip collar (14).

    NOTE: These screws do not secure the collar to the shaft, but instead lock the set screws beneath them.

14. Loosen third and fourth set screws (13) until collar slides freely along piston shaft.

15. Loosen special retaining nut (15) that anchors hydraulic pump body (18) to the pump mount (12). Slide nut and tab lockwasher (16) away from body.

    NOTE: The entire hydraulic section may now be removed by pulling pump body away from pump mount. Air valve

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trip collar (14), retaining nut, and tab lockwasher may be removed from piston shaft as the shaft is withdrawn from pump mount.

16. Inspect U-cup seal (11) in the upper face of pump mount. Replace if damaged.

17. Remove siphon ball seat (25) from bottom of pump body.

⊘ Avoid scratching pump plunger (19) and inside of pump body during disassembly and repair of pump. Surface scratches on these parts may cause excessive leakage during operation.

18. Hold pump body (18) and push threaded (air cylinder) end of pump plunger (19) toward siphon ball seat (25) until pressure ball and seat (22) appear.

19. Pull pressure ball seat from pump body.

20. Unscrew pressure ball seat from pump plunger.

21. Inspect ball seats and balls for wear and damage. Replace if necessary.

22. Remove pump shaft wiper retaining ring (32) from pump body using snap ring pliers or other pointed tool.

⊘ Retaining ring may be damaged when removed. Replace with new ring during reassembly.

23. Remove pump shaft wiper (30) and flat washer (31) from pump body.

NOTE: It may be necessary to heat the top of pump body with a flameless electric heat gun to soften hot melt adhesive around the seal.

24. Clean all components of hydraulic section by heating in a container of Type R solvent to the melting point of the adhesive.

NOTE: Alternate heating and cleaning methods include:

a. Heat components with a flameless electric heat gun. Wipe parts with a clean cloth.

b. Submerge parts in an ultrasonic cleaner.

c. Submerge parts in a chemical cleaner.

⚠ Do not clean any component of a pressurized fluid system in halogenated hydrocarbon solvents. See Safety Summary, Section 40-1, for further details. Using halogenated hydrocarbon solvent could cause an explosion.

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25. Use the following procedure to disassemble the four-way air control valve. Use Figure 15 to aid in disassembly.

    a. Remove four screws (1,5) holding each poppet seal (4) to air valve body (10).

       NOTE: Removing poppet seats frees the detent pin (7) and spacers (2).

    b. Hold the shifter link (6) and unscrew detent pin (7).

       NOTE: Removing detent pin frees the upper poppet (8).

    c. Pull the shifter link out of air valve body.

    d. Inspect poppets (8) and poppet seats (4) for wear or damage. Replace worn or damaged parts.

       NOTE: Replace entire poppet seat if poppet seat washer is damaged.

26. Disassemble valve shifter in the following manner. Use Figure 16 as a guide.

    a. Remove two screws to disconnect valve shifter from pump mount.

    b. Remove two screws and lockwashers to disconnect control arm bracket from control arm.

    c. Push control arm away from bracket to relieve spring pressure.

    d. Slide pin out of bracket inside wall to remove spring.

AIR OPERATED PISTON PUMP ASSEMBLY (Figure 14)

1. Insert pump shaft wiper (30) into pump body with groove in seal facing inward.

   ⊘ All hot melt adhesive material must be removed from wiper cavity and retaining ring groove in pump body to properly install and seat pump shaft wiper.

2. Insert flat washer (31) into pump body over pump shaft wiper.

3. Install pump shaft wiper retaining ring (32) in pump body using snap ring pliers or other pointed tool.

   NOTE: An audible snap will indicate when the ring enters the groove.

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4. Place threaded end of pump body (18) into pump mount (12) and secure with special nut (15) and tab lockwasher (16).

5. Insert U-cup seal (11) into pump mount with groove in seal facing outward.

6. Screw pressure ball seat (22) and pressure ball (21) into pump plunger (19).

7. Insert air motor end of plunger into pump body and up into the bottom hole of pump mount.

8. Place trip collar (14) over threaded end of plunger and push plunger out through top hole of pump mount.

9. Tighten two set screws (13) on trip collar into groove on plunger shaft. Secure second set of set screws (13) in each hole in collar.

   NOTE: Make sure inner set screws mate with shaft groove when reassembling collar to plunger shaft.

10. Assemble valve shifter (33) to pump mount with two screws (36).

11. Lubricate valve shifter and trip collar with lubricant (Nordson P/N 900 252).

12. Pull air motor end of plunger as far out of pump mount as possible.

13. Place piston washer (8) onto plunger.

14. Place one piston cup (10) over washer with curved edge downward toward pump mount. Place piston seal washer (9) over cup.

15. Mount lower slab gasket (5) in pump mount groove.

16. Slide air cylinder (6) over partially assembled piston.

17. Seat air cylinder onto slab gasket in pump mount.

18. Raise air piston to top of air cylinder.

19. Place second cup seal on top of seal washer with curved edge toward top of cylinder.

20. Place second piston washer (8) onto cup.

21. Secure piston assembly with locknut (7).

22. Place slab gasket (5) into cylinder head (4) groove.

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23. Secure cylinder head and air cylinder onto pump mount with four screws (2) and four lockwashers (3). Use teflon paste (P/N 900 236) on threads.

24. Torque cylinder head screws (2) to 5 ft-lb (7 Nm).

25. Place valve gaskets (1) on cylinder head and pump mount.

26. Attach four-way air control valve (34) to pump with four screws (35) and lockwashers (3). Use teflon paste (P/N 900 236) on threads.

27. Check o-ring (27) and backup ring (26) on connecting tube (28) for damage. Replace as necessary.

28. Slide pump assembly into the applicator and seat connecting tube in manifold.

29. Secure pump assembly to applicator with three screws.

30. Attach air hose to four-way valve.

31. Mount upper tank enclosure to applicator and secure with one captive screw.

AIR OPERATED GEAR PUMP DISASSEMBLY (Figure 18)

The rotary air motor contains no field serviceable components. If service is necessary, replace entire air motor with Nordson P/N 275 335. The gear pump also contains no field serviceable components. However, the pump may be disassembled for cleaning and inspection. If internal gear pump parts are broken or worn, replace entire gear pump with Nordson P/N 275 190.

NOTE: The rotary air motor mechanism should be lubricated. However, very little daily lubrication is required.

Wear safety glasses, safety gloves (P/N 902 514), and protective clothing to prevent injury from hot applicator parts, hot melt adhesive material, and hot gun surfaces.

1. Remove upper tank enclosure by removing one captive screw.

This captive screw is at tank temperature. Failure to wear safety gloves could result in serious burns.

2. Set pressure regulator to zero.

3. Remove copper tubing and hose assembly from rotary air motor (1).

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4. Remove three screws and lockwashers that anchor pump assembly to applicator tank.

5. Pull pump straight up disengaging connecting tube from manifold.

6. Remove two set screws (2) from pump mount assembly (6).

   NOTE: These set screws do not secure the air motor to the pump mount, but instead lock the set screws beneath them.

7. Loosen third and fourth set screws (2) until air motor moves freely in the pump mount.

8. Lift air motor (1) and top half of drive coupling (3) out of pump housing.

   NOTE: The elastomer spider in the drive coupling may or may not separate from the bottom of the coupling when the air motor is removed.

9. Attempt to turn the rotary air motor by hand in a clockwise direction. If the air motor turns freely, continue with the disassembly procedure.

   ⊘ The rotary air motor is designed to be turned only in the CLOCKWISE direction. Damage to the motor internal parts may result if the motor is turned in the counterclockwise direction.

10. Remove socket head screws and lockwashers from the top of the gear reducer.

11. Remove set screw on lower half of drive coupling (3) and slide coupling off shaft.

12. Push down on the pinion gear shaft and remove the air motor assembly mount (6).

13. Remove two set screws (22) from the lower drive coupling to free the drive gear assembly.

14. Invert the gear reducer housing over an open container to drain the gear reducer lubricant.

15. Carefully work the pinion gear shaft and drive gear shaft out of the gear reducer housing.

16. Inspect pinion gear and drive gear assemblies, bearings, and shaft surfaces for wear or damage. Replace as necessary.

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If replacement is required, the gears should be replaced as a set. Failure to replace the mating gears as a set will result in continued wear or damage.

17. Remove two screws and lockwashers from gear reducer housing.

18. Remove pressure control valve (23) by removing two screws (29) and lockwashers (28).

19. Remove gear reducer housing from lower pump mount. Inspect insulator and o-rings for wear or damage. Replace if necessary.

20. Remove four spline head screws (17) from pump housing.

NOTE: The gear pump contains no field serviceable parts. If replacement is required, use Nordson P/N 275 190. A 12-point socket is included in the pump assembly rebuild kit for convenience.

21. Rotate the pump counterclockwise using a screwdriver on the slotted shaft.

NOTE: If the shaft rotates freely, no further disassembly is required. If the pump binds or is to be disassembled for inspection and cleaning, continue to the next step.

22. Remove four socket head screws from top of gear pump.

23. Gently rap on the top of slotted drive shaft and bottom of idler shaft to separate the pump plates.

Do not pry the pump plates apart. Damage to mating surfaces will cause the pump to leak when assembled.

Solidified hot melt material may prevent the plates from separating. If it is necessary to heat the pump, use an electric oven with forced air circulation or a flameless electric heat gun. Never heat any component with a torch or other open flame.

24. Clean components in a bath of Type R solvent heated to the melting temperature of the hot melt material.

NOTE: Alternate methods of heating and cleaning include:

a. Heat components with a flameless electric heat gun and wipe with a clean cloth.

b. Submerge parts in an ultrasonic cleaner.

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c. Submerge parts in a chemical cleaner.

Never clean any component of a pressurized fluid system with halogenated hydrocarbon solvents. See Safety Summary, Section 40-1, for further details. Using a halogenated hydrocarbon solvent in this system can cause an explosion.

AIR OPERATED GEAR PUMP ASSEMBLY (Figure 18)

1. Reassemble pump.

   NOTE: Be certain pump plates are aligned properly. The stamped letters should appear on the same side of the pump.

2. Assemble spacers (9) onto the pump mount (16).

3. Position lower gear reducer housing (31) onto mount and secure with two screws (9) and lockwashers. Torque the screws to 5-8 ft/lb.

4. Assemble the pinion gear assembly and drive gear assembly into the gear reducer housing.

   Tape the end of the drive gear output shaft before shaft is inserted through lower oil seal. The keyway edges will cut the oil seal if not taped, causing leakage and premature gear reducer failure.

5. Assemble lower drive coupling onto the output shaft and secure with two set screws (22).

6. Assemble gear pump onto pump mount (16) and coupling insert (14). Secure with two screws (17). Torque the screws to 8-10 ft/lb.

7. Check o-ring (20) on crossover tube (19) for damage. Replace if necessary.

8. Push control valve (23) through hole in gear reducer housing (31) and into gear pump housing. Secure with two screws (29) and lockwashers (28).

9. Press the air motor mount assembly (6) onto gear reducer housing (31) and secure with six screws (12) and lockwashers (13). Torque the screws to 5-8 ft/lb.

10. Slide lower coupling onto pinion shaft and secure with set screw. Ensure the set screw is against flat on shaft.

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11. Slide rotary air motor and drive coupling through hole in top of mount assembly.

12. Align thermoplastic spider in lower half of drive coupling with upper half of coupling. Push together firmly.

13. Orient the air motor as shown in Figure 17 and tighten set screws in pump mount.

    NOTE: Set screws must mate with groove in air motor.

14. Install second set of set screws in pump mount to lock air motor. Torque the screws to 1-2 ft/lb.

15. Slide pump assembly into applicator tank and seat connecting tube in manifold.

16. Secure pump assembly to applicator with three screws and lockwashers.

17. Remove vent plug (5) and pipe plug (10) from gear reducer housing.

18. Fill the gear reducer housing with lubricant (P/N 275 284) until lubricant flows from the plug hole in side of reducer.

19. Reinstall vent plug (5) and pipe plug (10) in gear reducer housing. Use teflon paste (P/N 900 236) on threads.

20. Attach air hose to air motor inlet port.

21. Attach copper tubing to air motor outlet port.

22. Mount upper tank enclosure to applicator and secure with one captive screw.

PRESSURE CONTROL VALVE DISASSEMBLY AND REPAIR (Figure 20)

1. Remove upper tank enclosure from applicator with one captive screw.

The captive screw is at tank temperature. Wear safety gloves (P/N 902 514), safety glasses, and protective clothing to prevent burns.

2. Relieve system pressure in the following manner:

   a. Set pump air regulator to zero.

   b. Trigger all guns to relieve trapped hydraulic pressure.

   c. Open manifold drain valve.

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Failure to relieve system pressure may result in serious burns when pressure control valve is removed.

3. Remove two screws and lockwashers that secure pressure control valve to pump housing.

4. Remove pressure control valve from gear pump by lifting straight up through the hole in pump mounting bracket.

5. Remove set screw (3) from the gear pump end of control valve body (6).

6. Remove pressure control valve nose (10) from valve body.

Solidified hot melt material may prevent parts from separating. If it is necessary to heat the valve, use an electric oven with forced air circulation or a flameless electric heat gun. Never heat any component with a torch or other open flame.

7. Remove pressure control valve spool (8) and inspect for char and foreign material in tapered grooves and drilled holes. Also check spool surfaces for burrs that would prevent free movement in the valve nose (10). Replace if damaged.

8. Turn control valve adjusting screw (1) full clockwise. Remove upper set screw (3).

9. Remove spring (7) and adjusting slide (4) from valve body.

10. Inspect o-rings (2,5) for damage. Replace if worn, damaged, or hardened.

11. Push adjusting slide (4) into valve body until it mates with adjusting screw (1).

12. Turn adjusting screw counterclockwise to engage threads on slide.

13. Rotate slide until hole in slide shows through slot in valve body.

14. Install set screw (3) into adjusting slide (4) and tighten.

15. Insert compression spring (7) into valve body.

16. Insert valve spool (8) into valve nose (10).

17. Insert nose into valve body and secure with set screw (3).

18. Inspect o-ring (9) for damage. Replace if worn, cut, or hardened.

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19. Insert pressure control valve downward through hole in pump mount and into gear pump housing.

20 Secure pressure control valve to pump mount with two screws and lockwashers.

21. Install upper tank enclosure onto applicator and secure with one captive screw.

22. Close manifold drain valve.

23. Start up system in accordance with Section III, Daily Startup.

24. Adjust pressure control valve in accordance with Section III, Pressure Control Valve Adjustment.

MANIFOLD DRAIN VALVE REMOVAL AND DISASSEMBLY (Figure 12)

Wear safety glasses, safety gloves (P/N 902 514), and protective clothing to prevent injury from hot applicator parts, splashed hot melt adhesive material, and hot gun surfaces.

Relieve system pressure before breaking any mechanical connections. Serious burns may result if drain valve is opened or removed with hydraulic pressure in the system.

1. Reduce input pressure to the air motor to zero at the regulator.

2. Trigger all guns to relieve trapped hydraulic pressure.

3. Open manifold drain valve.

4. Remove upper and lower tank enclosure from unit.

5. Remove drain valve from side of manifold by removing four hex head screws.

6. Remove retaining ring using snap ring pliers.

7. Unscrew drain valve internal stem with screwdriver.

8. Remove valve stem.

9. Clean components in a bath of Type R solvent heated to the melting temperature of the adhesive material.

NOTE: Alternate methods of heating and cleaning include:

a. Heat components with a flameless electric heat gun. Wipe parts with a clean cloth.

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b. Submerge parts in an ultrasonic cleaner.

c. Submerge parts in a chemical cleaner.

Never clean any component of a pressurized fluid system with halogenated hydrocarbon solvents. See Safety Summary, Section 40-1, for further details. Using a halogenated hydrocarbon solvent in this system could cause an explosion.

10. Inspect valve stem and ball for wear or damage. Replace worn or damaged parts.

    NOTE: Ball seat should also be checked for scratches and other damage. Replace drain valve if seat is damaged.

11. Insert ball into valve body.

12. Thread valve stem into valve body full clockwise.

13. Insert retaining ring into groove in valve body using snap ring pliers.

14. Inspect o-ring for wear, damage, or hardening. Replace if necessary.

15. Attach drain valve to manifold using four screws.

16. Attach upper and lower tank enclosure to unit.

17. Restore system to normal operation in accordance with Section III, Daily Operation.

HEAT EXCHANGER REMOVAL (Figure 12)

Wear safety glasses, safety gloves (P/N 902 514), and protective clothing to prevent injury from hot applicator parts, splashed hot melt adhesive material, and hot gun surfaces.

Relieve system pressure before breaking any mechanical connections. Serious burns may result if heat exchanger is removed with hydraulic pressure in the system.

1. Reduce input pressure to the air motor to zero at the regulator.

2. Trigger all guns to relieve trapped hydraulic pressure.

3. Open manifold drain valve.

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4. Remove o-ring boss plug (4) and heat exchanger (5) from rear of manifold. Use a 1/4-20 screw to pull heat exchanger from manifold.

If it is necessary to heat the manifold to soften solidified hot melt adhesive material, use a flameless electric heat gun. Never heat components with a torch or other open flame.

5. Clean the heat exchanger in a bath of Type R solvent heated to the melting temperature of the adhesive material.

NOTE: Alternate heating and cleaning methods include:

a. Heat components with a flameless electric heat gun. Wipe parts with a clean cloth.

b. Submerge parts in an ultrasonic cleaner.

c. Submerge parts in a chemical cleaner.

Never clean any component of a pressurized fluid system with halogenated hydrocarbon solvents. See Safety Summary, Section 40-1, for further details. Using halogenated hydrocarbon solvents in this system could cause an explosion.

6. Inspect external surfaces for damage and burrs that could interfere with smooth fluid flow causing blockage in passages. Replace heat exchanger if damaged.

7. Insert heat exchanger and tighten plug into manifold.

8. Close manifold drain valve.

9. Restore system to normal operation in accordance with Section III, Daily Operation.

TEMPERATURE CONTROL REPLACEMENT

The Series 2000 hot melt applicators contain energized electrical components with potentials that could be fatal. Disconnect and lock out input electrical power to the applicator before attempting to perform maintenance on this equipment.

The temperature control board and potentiometer board contain no field serviceable components. The boards are shipped as complete, calibrated units. The boards need not be replaced as a set.

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Temperature Control Board Replacement

1. Open the applicator main circuit breaker.
2. Disconnect and lock out input power to the applicator.

Failure to disconnect external power to the applicator presents a serious shock hazard. Input terminal board TB1 and input terminals on main circuit breaker are still electrically energized if external power is not disconnected, even though the main circuit breaker is open.

3. Remove electrical enclosure top cover by removing three captive screws.
4. Disconnect three (two) plugs and ribbon connector from temperature control printed circuit board.
5. Remove temperature control board from applicator.
6. Mount new temperature control board on applicator.
7. Plug in four (three) connectors in receptacles on printed circuit board.
8. Replace electrical enclosure cover and secure with three captive screws.
9. Reset temperature controls to minimum setting.
10. Restore input power to the applicator.
11. Restore system to normal operation in accordance with Daily Startup Procedure.

Potentiometer Board Replacement

1. Open the applicator main circuit breaker.
2. Disconnect and lock out input electrical power to the applicator.

Failure to disconnect and lock input electrical power to the applicator presents a serious shock hazard. Input terminal board TB1 and input terminals on main circuit breaker are still electrically energized if external power is not disconnected, even though the main circuit breaker is open.

3. Remove electrical enclosure top cover by removing three captive screws.

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4. Remove the ribbon connector from the back of the potentiometer board.

5. Open the front glass enclosure and remove the potentiometer board by removing four screws.

6. Replace the potentiometer board and secure with four screws.

7. Secure the ribbon connector to the back of the potentiometer board.

8. Secure electrical enclosure in place with three captive screws.

9. Reset temperature controls to minimum setting.

10. Restore system to normal operation in accordance with Daily Startup procedure.

SOLID-STATE RELAY (SSR) REPLACEMENT

The Series 2000 hot melt applicators contain energized electrical components with potentials that could be fatal. Disconnect and lock out input electrical power to the applicator before attempting to perform maintenance on this equipment.

Wear safety gloves (P/N 902 514) to prevent injury from hot heat sink and solid-state relay.

1. Open applicator main circuit breaker.

2. Disconnect and lock out input power to the applicator.

Failure to disconnect external power to the applicator presents a serious shock hazard. Input terminal board TB1 and input terminals on main circuit breaker are still electrically energized if external power is not disconnected, even though the main circuit breaker is open.

3. Remove electrical enclosure top cover by removing three captive screws.

4. Disconnect four wires from solid-state relay.

   NOTE: Carefully note the position of the wires. The two large wires (Nos. 49 (37) and 50 (38)) carry 230 VAC and the two smaller black wires (Nos. 43 (31) and 44 (32)) carry 12 Vdc.

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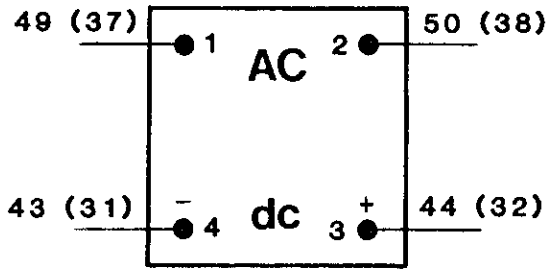
5. Remove the solid-state relay from the heat sink by removing two screws.

6. Secure a new solid-state relay to the heat sink using two screws.

7. Connect the four wires to the solid state relay in accordance with the below illustration.



Wire numbers in parenthesis ( ) are for the 2002/2202 applicators.

8. Replace enclosure and secure with three captive screws.

9. Set temperature controls to minimum setting.

10. Restore input power to applicator.

11. Restore system to normal operation in accordance with Daily Startup Procedure.

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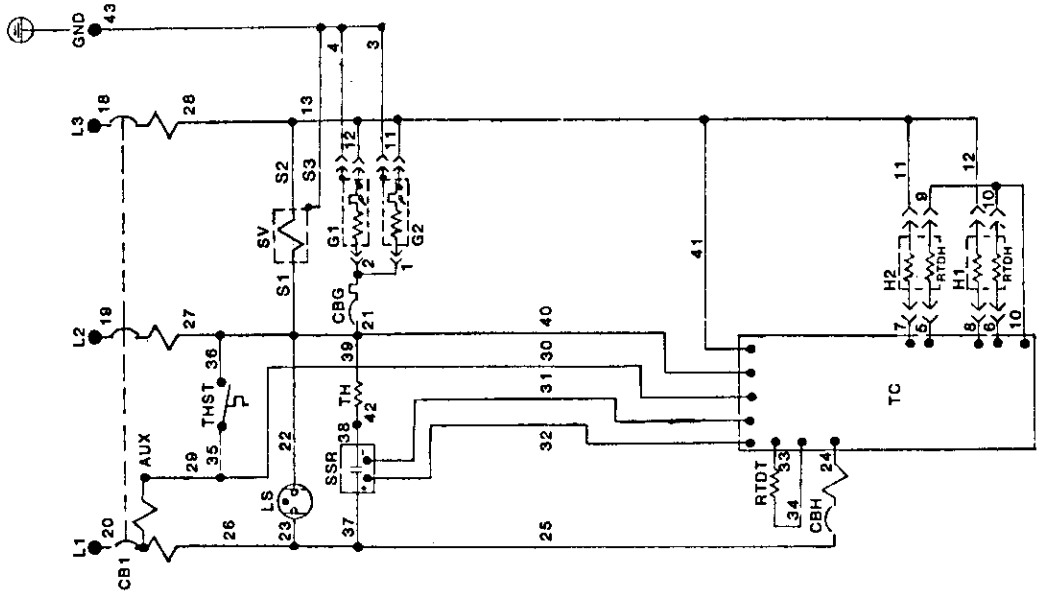
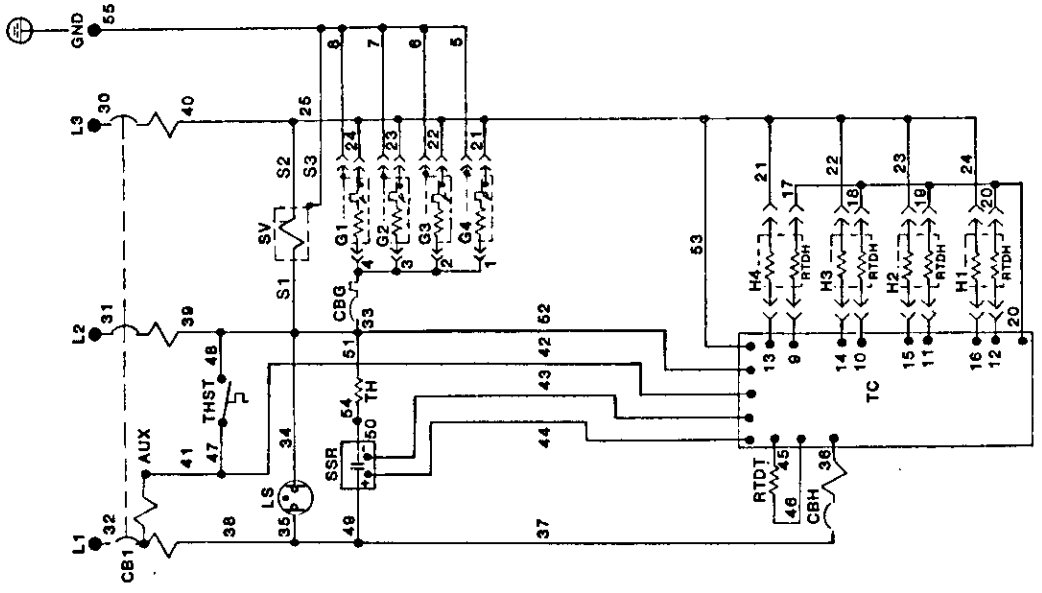
SECTION V
DIAGRAMS AND TABLES



2002/2202



2004/2204

Figure 5 - Electrical Schematic, 180-256 VAC, 3 Phase

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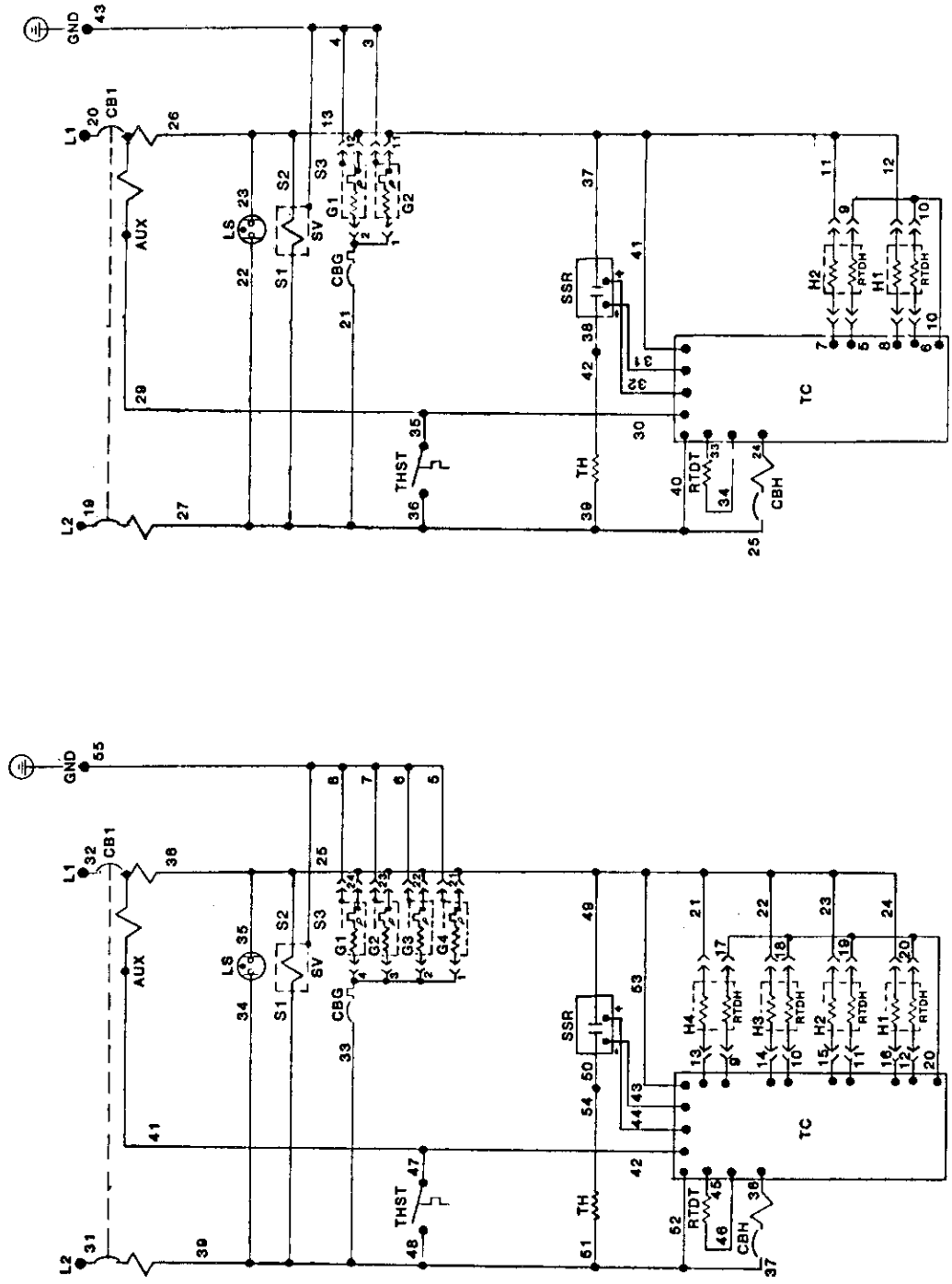

Figure 6 - Electrical Schematic, 180-256 VAC, Single Phase

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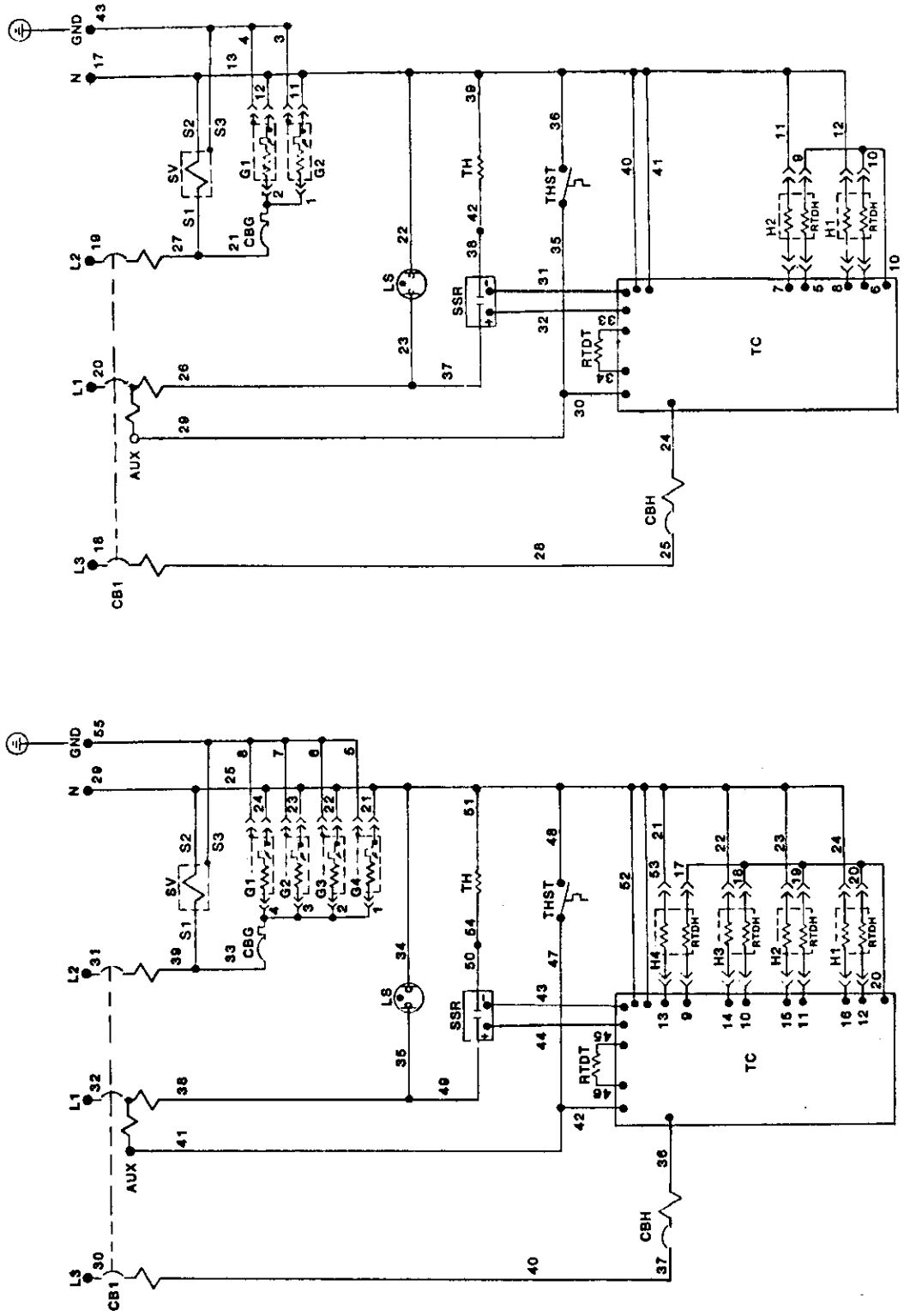

Figure 7 - Electrical Schematic, 380 VAC, 3 Phase

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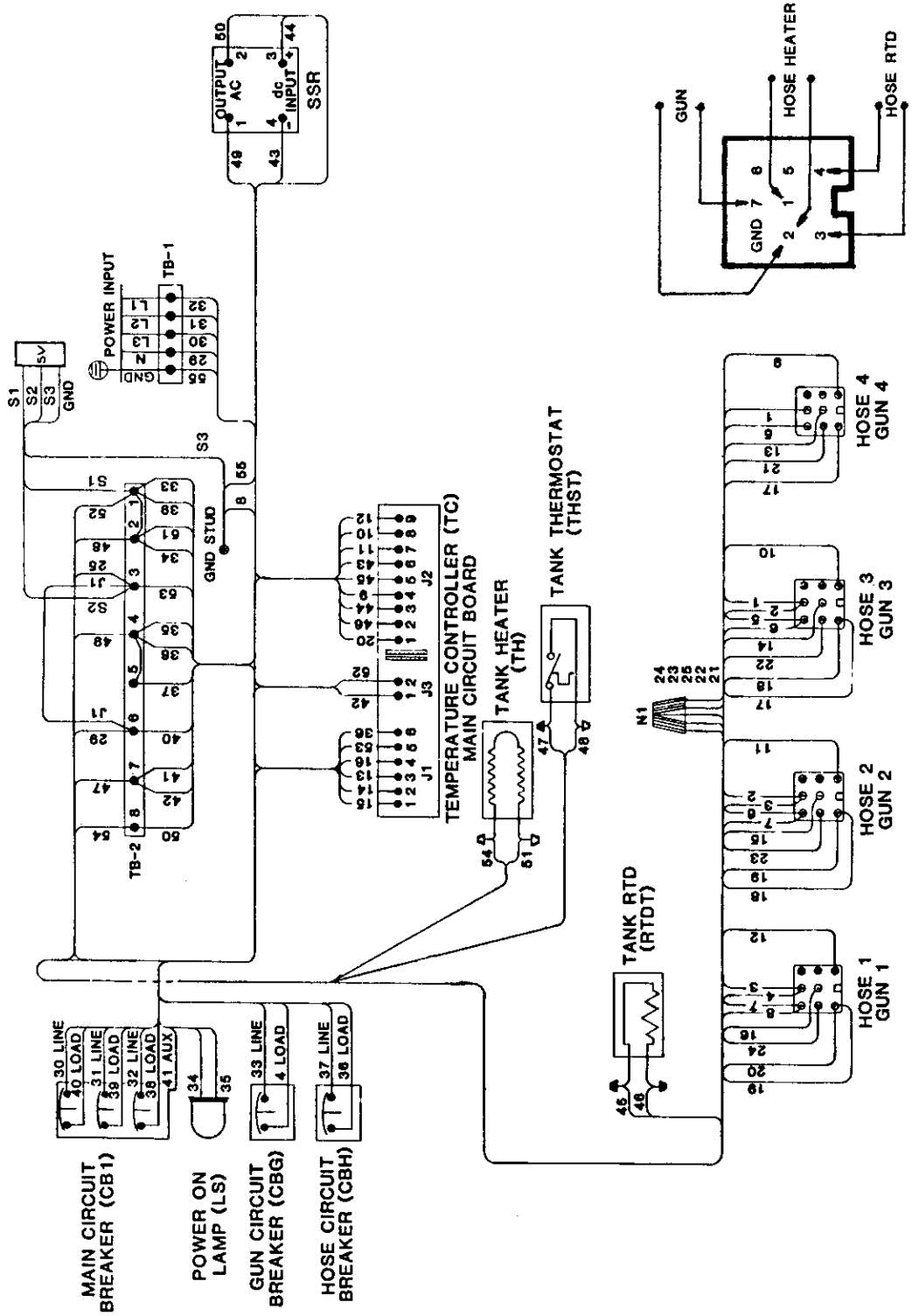

Figure 8 - Electrical Wiring Diagram, 2004/2204

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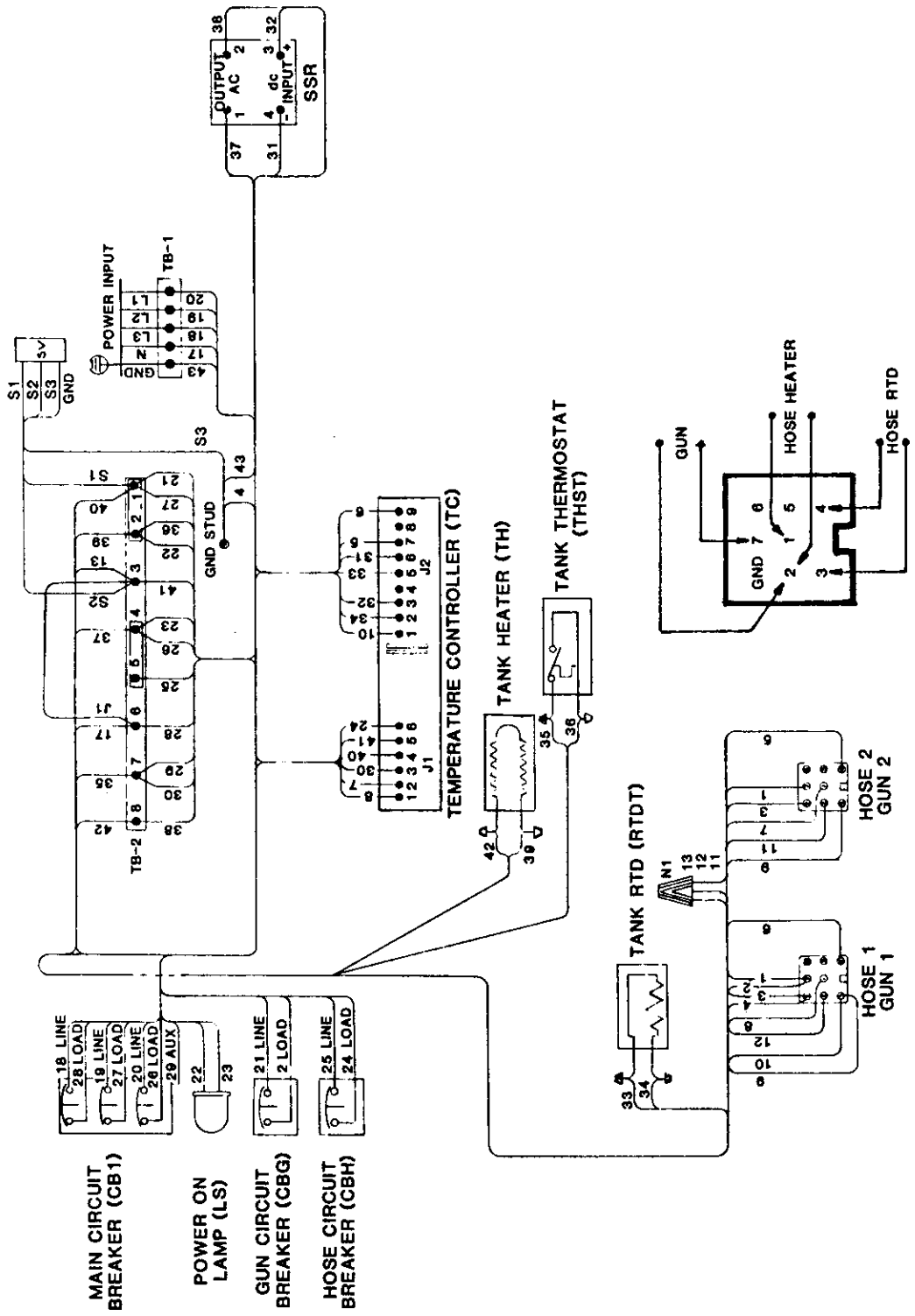

Figure 9 - Electrical Wiring Diagram, 2002/2202

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Table 5 - INDIVIDUAL COMPONENT POWER REQUIREMENTS

Component	Power (watts)*	Component	Power (watts)*
SYSTEM (max)**			
2002 (230V)	4680	2002 (380V)	3930
2004 (230V)	6280	2004 (380V)	5280
2202 (230V)	5600	2202 (380V)	4700
2204 (230V)	7200	2204 (380V)	6050
TANK			
2002/2004	2310 (208V)	2825 (230V)	2580 (380V)
2202/2204	3000 (208V)	3670 (230V)	3360 (380V)
GUNS			
AD-24-2	210	H200-2	210
-4	210	-4	210
-8	330	-8	330
-2E	330	-2E	330
-4E	300	-4E	300
-2LP	150	-2LP	150
-4LP	200	-4LP	200
-8LP	400	-8LP	300
H20	180	AD-31D	60
AUTOMATIC HOSES		HANDGUN HOSES	
2 ft (0.6 m)	47	8 ft (2.4 m)	188
4 ft (1.2 m)	94	16 ft (4.9 m)	376
6 ft (1.8 m)	141		
8 ft (2.4 m)	188		
10 ft (3.1 m)	235		

* Unless noted, all of the above power consumption figures were calculated at 230 VAC. For applications using other input power arrangements, recalculate power consumption using the optional input voltage.

** The actual power requirement for the Series 2000 hot melt applicators is determined by the additive power requirements of individual components used in the applicator system. The total requirement depends on tank size, quantity and length of hoses, and quantity and type of guns used. The maximum power requirement of the system is shown here.

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SECTION VI
ILLUSTRATED PARTS LIST

INTRODUCTION

The Illustrated Parts List details and illustrates the assemblies and components of the Series 2000 hot melt applicators with an air driven dual-acting piston pump or spur gear pump. Those configurations defined in Section I are detailed in the following lists.

COLUMN IDENTIFICATION

FIGURE ITEM COLUMN

The Figure Item column indicates the callout number in the associated figure. A dash in this column denotes that no callout has been made for that part.

PART NUMBER COLUMN

The Part Number column indicates the Nordson part number for the physical part or assembly. A dash in this column indicates a nonsaleable part or a nonsaleable subassembly of a saleable assembly.

DESCRIPTION COLUMN

The Description column presents a written description of the part or assembly. Nomenclature, dimensional information, and material information appear in this column.

REQUIRED COLUMN

The Required column specifies the quantity of the part required per unit or assembly. A dash in this column indicates that no specific quantity is required. The term "Ref" in this column indicates the part or assembly has been included for reference only.

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UNIT ASSEMBLY PARTS LIST - PART 1

Item No.	Part No.	Description	Req'd
-	275 144	Hot Melt Applicator, Model 2002 w/Piston Pump, 2 Hose, 200/230 VAC	Ref
-	275 014	Hot Melt Applicator, Model 2004 w/Piston Pump, 4 Hose, 200/230 VAC	Ref
-	275 145	Hot Melt Applicator, Model 2202 w/Piston Pump, 2 Hose, 200/230 VAC	Ref
-	275 013	Hot Melt Applicator, Model 2204 w/Piston Pump, 4 Hose, 200/230 VAC	Ref
-	275 274	Hot Melt Applicator. Model 2002 w/Gear Pump, 2 Hose, 200/230 VAC	Ref
-	275 273	Hot Melt Applicator, Model 2004 w/Gear Pump, 4 Hose, 200/230 VAC	Ref
-	275 276	Hot Melt Applicator, Model 2202 w/Gear Pump, 2 Hose, 200/230 VAC	Ref
-	275 275	Hot Melt Applicator. Model 2204 w/Gear Pump, 4 Hose, 200/230 VAC	Ref
-	275 458	Hot Melt Applicator, Model 2004 w/Gear Pump, 4 Hose, 380Y/220 VAC	Ref
-	275 459	Hot Melt Applicator, Model 2202 w/Gear Pump, 2 Hose, 380Y/220 VAC	Ref
-	275 460	Hot Melt Applicator, Model 2204 w/Gear Pump, 4 Hose, 380Y/220 VAC	Ref
-	275 461	Hot Melt Applicator, Model 2202 w/Gear Pump, 2 Hose, 380Y/220 VAC	Ref
-	275 462	Hot Melt Applicator, Model 2204 w/Piston Pump, 4 Hose, 380Y/220 VAC	Ref
-	275 463	Hot Melt Applicator, Model 2004 w/Piston Pump, 4 Hose, 380Y/220 VAC	Ref
-	275 464	Hot Melt Applicator, Model 2002 w/Piston Pump, 2 Hose, 380Y/220 VAC	Ref
-	275 465	Hot Melt Applicator, Model 2202 w/Piston Pump, 2 Hose, 380Y/220 VAC	Ref
1	275 089	° Assembly, Upper Enclosure	1
2	900 236	° Paste, Teflon	-
3	973 953	° Adapter, Pipe, 1/4-NPT x 1/8-NPT	1
4	972 200	° Elbow, Male, 37 deg, 9/16-18 x 1/4-NPT	1
5	982 050	° Screw, Hex Head, M8-1.25 x 35 mm	3
6	983 414	° Washer, Flat, M8	3
7	273 141	° Drive Assembly, Piston Pump, Air Operated	1
8	985 112	° Rivet, Pop	6
9	982 119	° Screw, Pan Head	8
10	275 071	° Air Control Assembly, Piston Pump	1
10	275 072	° Air Control Assembly, Gear Pump	1
11	-	° BASE ASSEMBLY (See Figure 11)	1
12	275 045	° Baseplate, Rear	1
-	273 143	° Strainer, 2002/2004 Piston Pump	1
-	273 042	° Strainer, 2202/2204 Piston Pump	1
-	273 041	° Strainer, 2002/2004 Gear Pump	1
-	273 142	° Strainer, 2202/2204 Gear Pump	1

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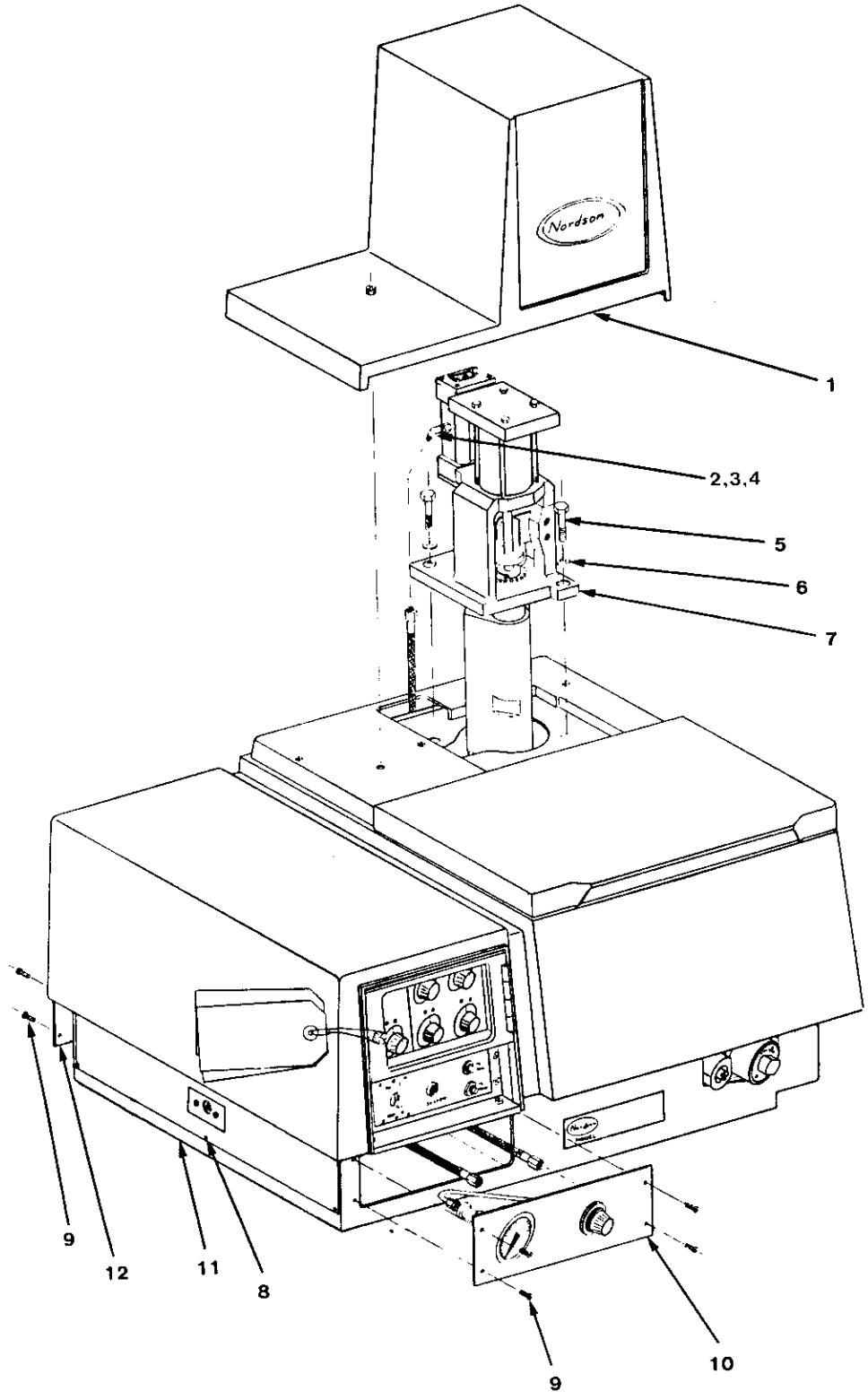

Figure 10 - Unit Assembly (Part 1)

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UNIT ASSEMBLY PARTS LIST - PART 2

Item No.	Part No.	Description	Req'd
-	-	Unit Assembly	Ref
1	275 089	° Assembly, Upper Enclosure	1
2	900 236	° Paste, Teflon	-
3	972 200	° Elbow, Male, 37 deg, 9/16-18 x 1/4-NPT	1
4	275 333	° Drive Assembly, Gear Pump, Air Operated	1
5	-	° BASE ASSEMBLY (See Figure 11)	1
6	971 501	° Elbow, Male, 3/8-Tube x 1/4-NPT (Gear Pump Only)	1
7	275 278	° Tubing, Copper, 3/8 in. OD x 15.00 in. long (Gear Pump Only)	1
8	971 250	° Connection, Male Tube (Gear Pump Only)	1
9	-	° Manifold, Exhaust (Gear Pump Only)	1
10	982 001	° Screw, Fillister Head, M5-0.8 x 25 mm (Gear Pump Only)	2
11	983 401	° Lockwasher, Split, M5 (Gear Pump Only)	2
-	275 284	° Lubricant, Gear Reducer, 8 oz (Gear Pump only)	1

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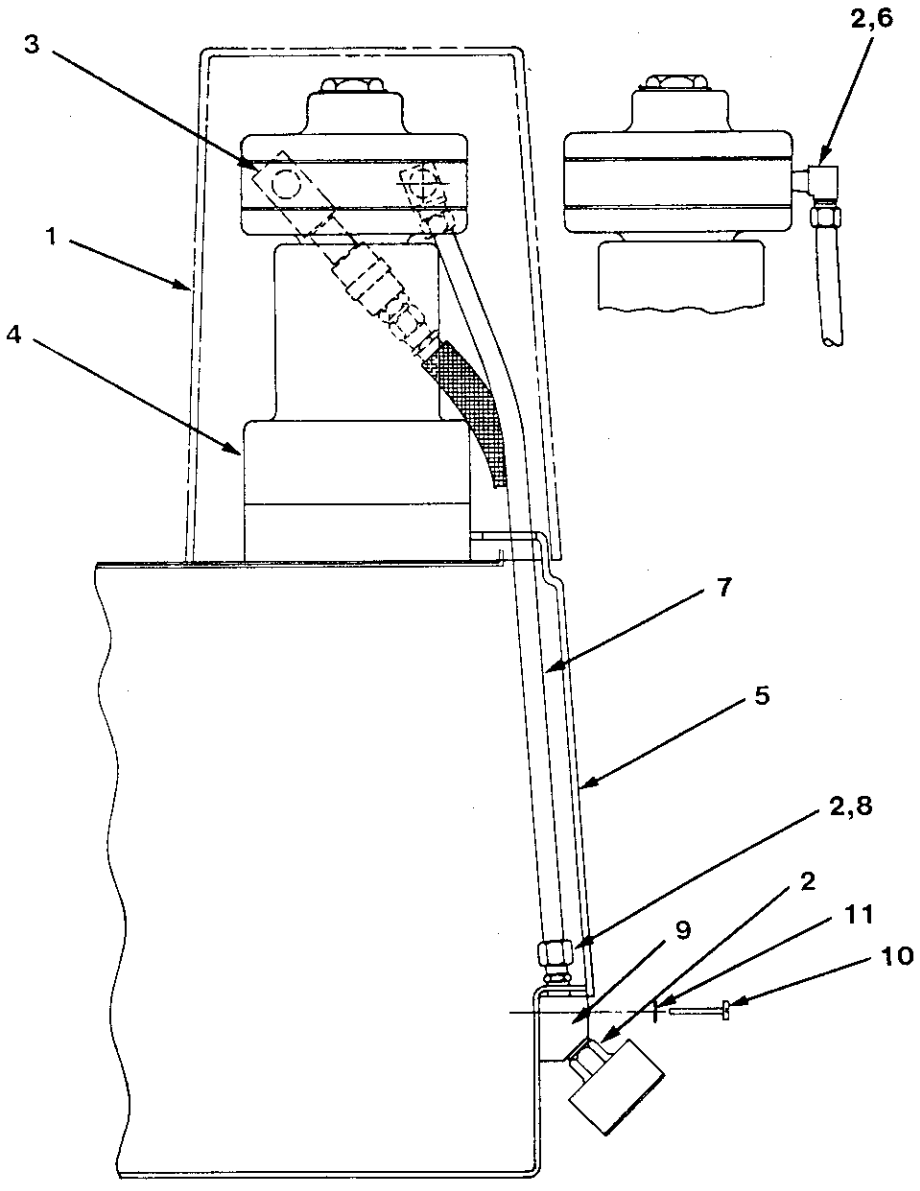

Figure 10 - Unit Assembly (Part 2)

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BASE ASSEMBLY PARTS LIST - PART 1

Item No.	Part No.	Description	Req'd
-	-	Assembly, Base, Series 2000	Ref
1	983 408	° Washer, Flat, Narrow, M5 2002/2202:	13
2	982 091	° Screw, Pan Head, M3-0.5 x 6 mm	7
3	982 116	° Screw, Pan Head, Captive	1
4	-	° Lid Assembly (See Service Parts List)	1
-	275 023	°° Hinge, Tank Cover Lid	1
-	275 032	°° Lid, Hinged Tank Cover	1
-	982 127	°° Screw, Flat Head, M4-0.7 x 8 nm	4
5	902 517	° Retainer, Ball Stud	2
6	981 727	° Screw, Hi-Lo, 4-24 x 0.38 in.	4
7	275 374	° Lid Assembly, Inner Tank, 2202/2204	1
7	275 373	° Lid Assembly, Inner Tank, 2002/2004	1
-	275 061	°° Lid, Inner Tank, 2202/2204	1
-	275 060	°° Lid, Inner Tank, 2002/2004	1
-	-	°° Stud, Ball	2
-	981 024	°° Screw, Pan Head, 6-32 x 0.19 in.	2
-	983 100	°° Lockwasher, Internal Tooth, No. 6	2
8	275 219	° Enclosure, Tank, 2002/2004	1
8	275 010	° Enclosure, Tank, 2202/2204	1
9	275 379	° Cover, Tank 2202/2204	1
9	275 378	° Cover, Tank 2002/2004	1
10	275 036	° Gasket, Tank Cover, 2202/2204	1
10	275 035	° Gasket, Tank Cover, 2002/2004	1
11	937 277	° Sensor, Tank Temperature, RTD	1
12	-	° Nut, Wire, 22 GA	4
13	-	° Manifold-Tank Assembly,	1
-	-	°° Tank, Machined, (See Service Parts List)	1
-	-	°° MANIFOLD ASSEMBLY (See Figure 12)	1
-	940 281	°° O-ring, Viton, 1.38 x 1.50 in.	2
-	982 109	°° Screw, Hex Head, M8-1.25 x 70 mm	6
-	983 414	°° Washer, Flat, M8	6
-	900 236	°° Paste, Teflon	-
-	275 224	°° Valve Assembly, Tank Drain	1
-	940 161	°°° O-ring, Viton, 0.62 x 0.75 in.	1
-	275 221	°°° Stem, Tank Drain Valve	1
-	275 220	°°° Body, Tank Drain Valve	1
-	273 222	°°° Tag, Warning	1
-	981 800	°°° Screw, Round Head, 0-80 x 0.12 in.	1
14	273 742	° Thermostat, 500°F (260°C), w/Insulator	1
-	-	°° Insulator, Thermostat	1
-	937 281	°° Thermostat, Close-on-Rise, 500°F (260°C)	1
15	843 048	° Hose, Pneumatic, Regulator to Pump Assembly	1

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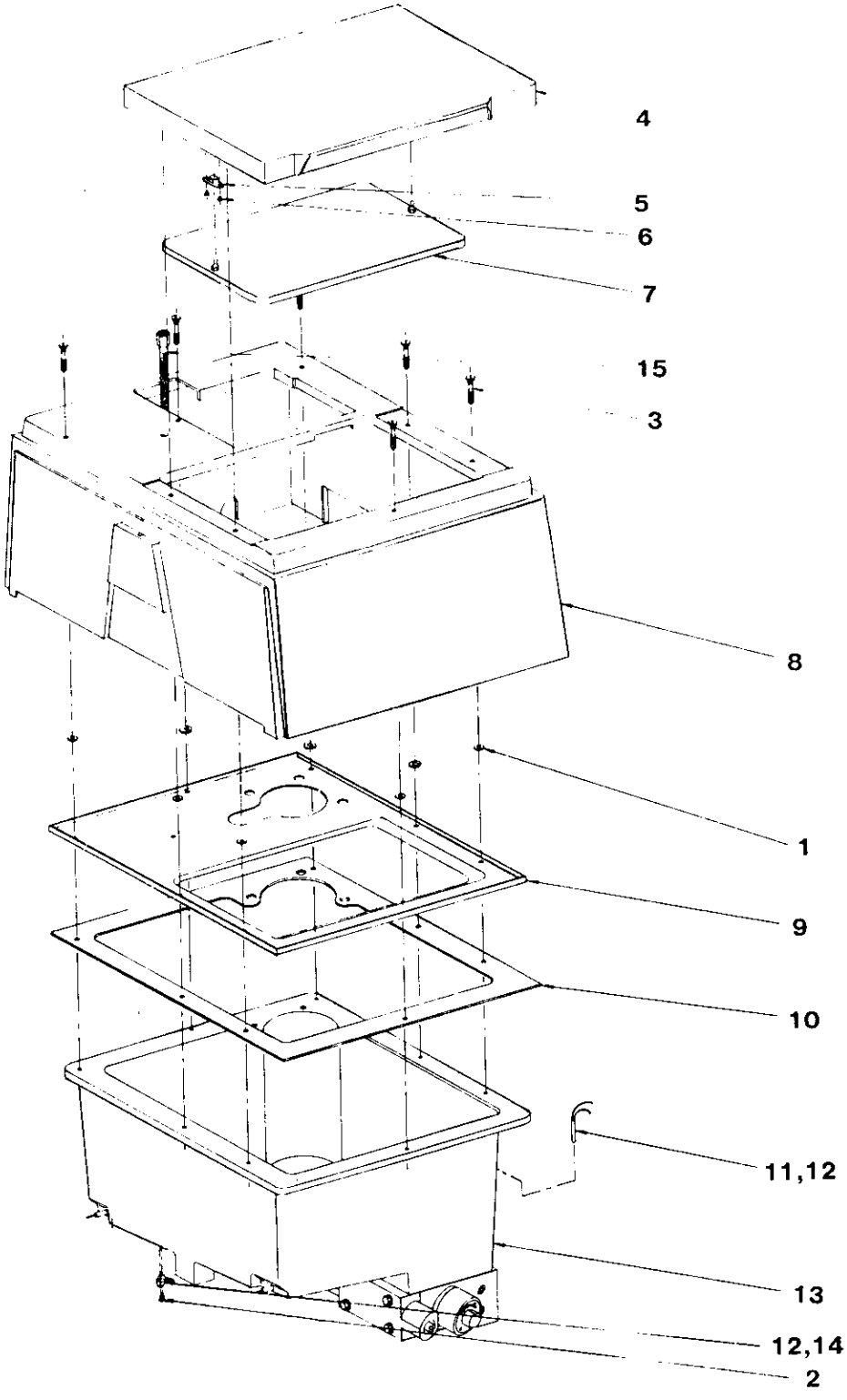

Figure 11 - Base Assembly (Part 1)

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BASE ASSEMBLY PARTS LIST - PART 2

Item No.	Part No.	Description	Req'd
-	-	Assembly, Base, Series 2000	Ref
1	933 298	° Marker Strip, 8-Station Terminal Block	1
2	982 119	° Screw, Pan Head, M5-0.8 x 10 mm 2004:	18
		2002/2202/2204:	16
3	982 124	° Screw, Pan Head, M4-0.7 x 20 mm	4
4	275 025	° Insulator, Circuit Breaker	1
5	933 297	° Marker Strip, 5-Station Terminal Block	1
6	275 093	° Heat Sink Assembly, 2202/2204	1
6	275 092	° Heat Sink Assembly, 2002/2004	1
-	275 069	°° Panel, Rear, Electrical Enclosure	1
-	275 081	°° Gasket, Heat Sink	1
-	939 576	°° Relay, Solid-State, 40 amp	1
-	939 573	°° Heat Sink, Exterior	1
-	983 411	°° Washer, Flat, M3	2
-	939 538	°° Relay, Solid-State, 25 amp	1
7	275 054	° Standoff, Circ. Board, M4-0.7 mm x 0.62 in.	5
8	982 091	° Screw, Pan Head, M3-0.5 x 6 mm	7
-	275 350	° Bracket, Terminal Block, 5 Station	1
9	983 408	° Washer, Flat, M5 2002/2202	2
10	275 012	°° Enclosure, Electrical, Fiberglass	1
11	982 116	° Screw, Pan Head, Captive	1
12	275 040	° Spacer, Tank	1
13	275 176	° Spacer, Manifold	2
14	273 043	° Insulation, Tank, 2202/2204	1
14	273 044	° Insulation, Tank, 2002/2004	1
15	983 417	° Washer, Flat, M8, Oversized OD	3
16	982 122	° Screw, Hex Head, M8-1.25 x 45 mm	2
17	275 322	° Temperature Control Assembly, 4 Hose	1
17	275 327	° Temperature Control Assembly, 2 Hose	1
-	275 094	°° Temperature Control, 4 Hose and Tank	1
-	939 574	°°° Board, Temperature Control, 2004/2204	1
-	939 575	°°° Board, Front Panel, 2004/2204	1
-	273 817	°°° Cable Assembly, Ribbon, 24-wire	1
-	275 130	°° Temperature Control, 2 Hose and Tank	1
-	275 128	°°° Board, Temperature Control, 2002/2202	1
-	275 129	°°° Board, Front Panel, 2002/2202	1
-	275 146	°°° Cable Assembly, Ribbon, 16-wire	1
-	982 119	°° Screw, Pan Head, M5-0.7 x 10 mm	4
-	275 313	°° Door Assembly, Control Access	1
-	275 099	°°° Panel, Elect. Enclosure, Front	1
-	982 142	°°° Screw, Flat Head, M3 x 10	4
-	275 320	°°° Hinge, Control Access Door	1
-	983 400	°°° Lockwasher, Split, M3	4
-	984 700	°°° Nut, Hex, M3	4
-	275 316	°°° Door, Control Access	1
-	275 319	°°° Latch, Door, Control Access	1
-	275 321	°°° Window, Control Access Door	1
-	275 318	°°° Retainer, Window	1
18	273 038	° Insulation, Tank Bottom, 2202/2204	1
18	273 039	° Insulation, Tank Bottom, 2002/2004	1

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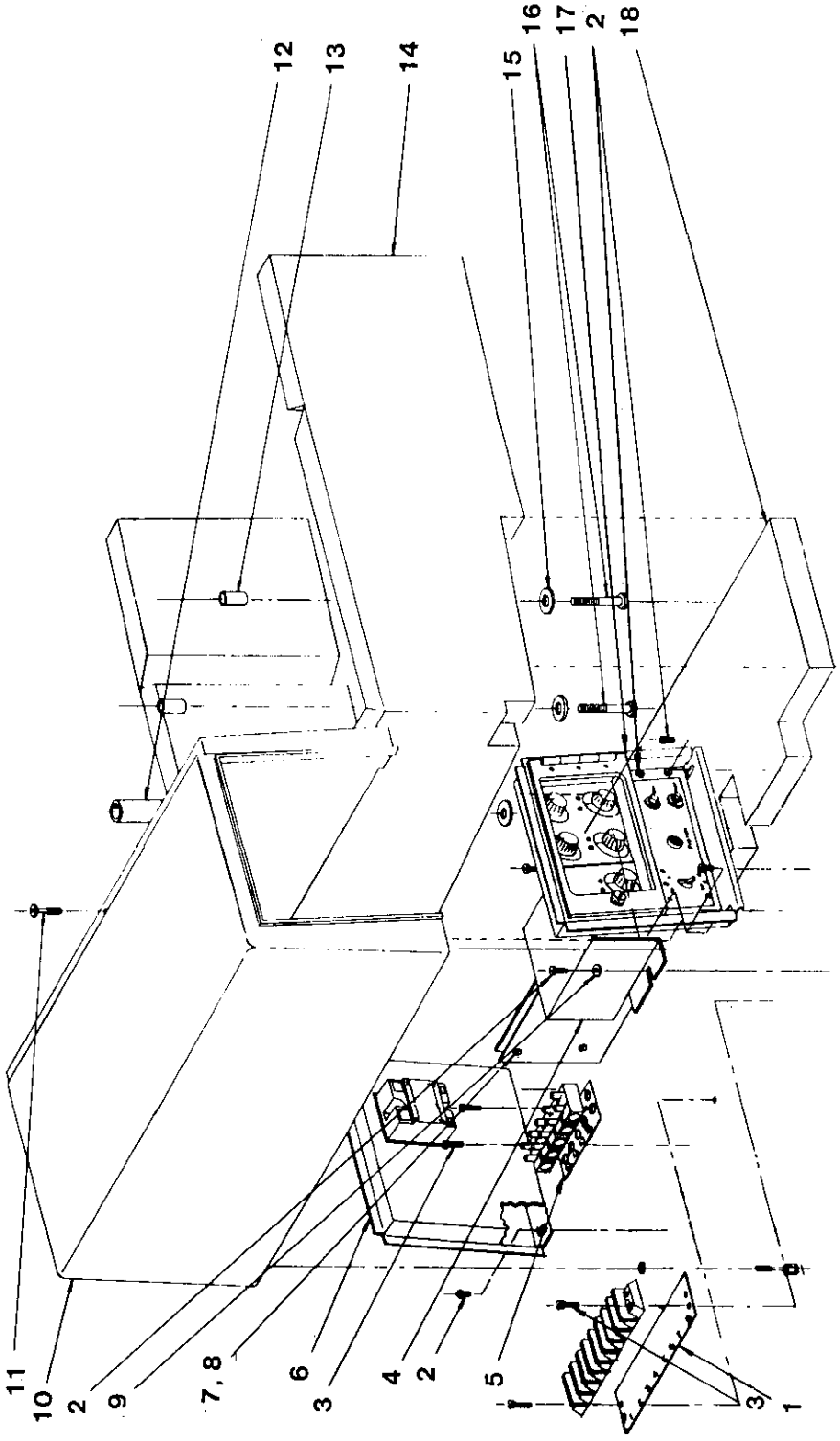

Figure 11 - Base Assembly (Part 2)

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BASE ASSEMBLY PARTS LIST - PART 3

Item No.	Part No.	Description		Req'd
-	-	Assembly, Base, Series 2000		Ref
1	-	° Base, Series 2000		1
2	-	° Nameplate, Warning		1
3	985 112	° Rivet, Pop	2004/2204:	8
			2002/2202:	4
4	275 107	° Screw, Captive, M5-0.8 mm x 1.47 in.		2
5	275 083	° Subpanel, Electrical Enclosure		1
6	983 408	° Washer, Flat, Narrow, M5	2002/2202:	13
7	-	° Grommet, Continuous		0.3 ft
8	982 119	° Screw, Pan Head, M5-0.8 x 10 mm	2004:	18
			2002/2202/2204:	16
9	275 279	° Connector Cable, 2 Screw		1
10	275 115	° Adapter Pipe, 1/4-NPTF		1
11	-	° Marker, Wire		-
12	982 114	° Screw, Hex Head, M8-1.25 x 100 mm		1
13	275 139	° Harness, Wiring, 2 Hose		1
13	275 118	° Harness, Wiring, 4 Hose		1
-	272 848	°° Dust Cover	2004/2204:	4
			2002/2202:	2
-	939 541	°° Base, Connector Mounting	2004/2204:	4
			2002/2202:	2
-	982 125	°° Screw, Pan Head, M3-0.5 x 16 mm		4
-	275 070	°° Nut Bar		1
-	933 295	°° Block, Terminal, Input		1
-	275 108	°° Block, Terminal, 8-Station		1
-	273 013	°° Circuit Breaker, 30 amp		1
-	939 577	°° Lamp, Power On		1
-	939 631	°° Circuit Breaker, 5.0 amp (2002/2202 only)		1
-	939 532	°° Circuit Breaker, 10 amp (2004/2204 only)		1
-	939 533	°° Circuit Breaker, 10 amp		1
-	275 140	°° Panel, Socket Cover (2002/2202 Only)		2
14	982 169	° Screw, Pan Head, M3-0.5 x 16 mm		4
15	275 065	° Nameplate, Hose No. 4 (2004/2204 Only)		1
16	275 064	° Nameplate, Hose No. 3 (2004/2204 Only)		1
17	275 063	° Nameplate, Hose No. 2, Series 2000		1
18	275 062	° Nameplate, Hose No. 1, Series 2000		1
19	275 042	° Insulation, Base		1
20	275 052	° Washer, C, 8 mm		3
21	843 048	° Hose, Pneumatic, Regulator to Pump Assembly		1
22	843 024	° Hose, Pneumatic, Input to Solenoid Valve		1
23	972 050	° Connector, Male, 9/16-18 x 1/4-NPT		1

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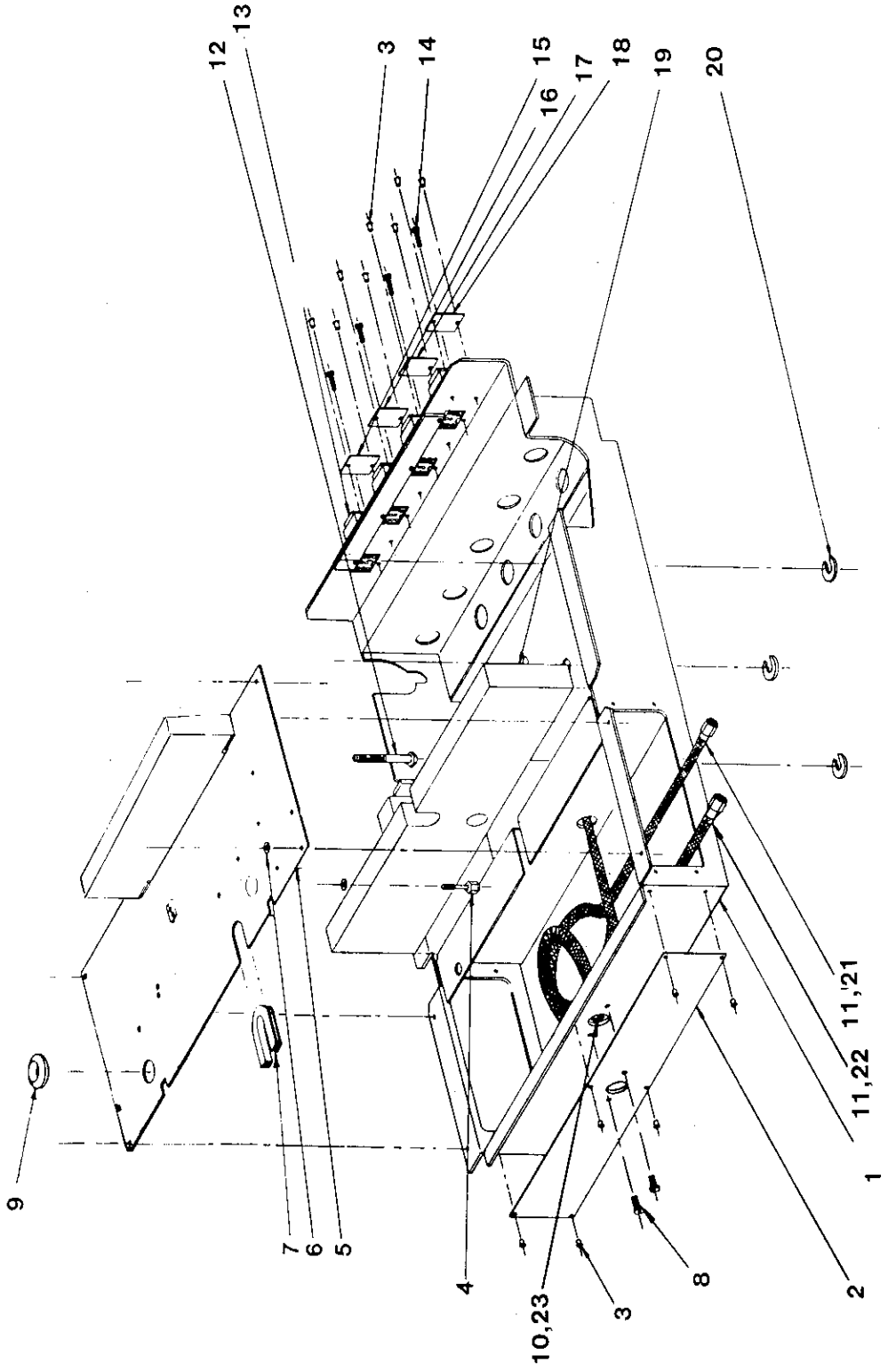

Figure 11 - Base Assembly (Part 3)

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MANIFOLD ASSEMBLY PARTS LIST

Item No.	Part No.	Description	Req'd
-	-*	Manifold Assembly (See Service Parts List)	Ref
1	275 310	° Manifold, Tank	1
2	973 574	° Plug, O-ring, 9/16-18, Str. Thread	16
3	945 032	°° O-ring, Viton	16
4	275 008	° Plug, O-ring Boss, 1.19 in. thread	1
5	945 035	°° O-ring. Viton, 7/8 in. OD Tube	1
6	275 009	° Heat Exchanger, Manifold	1
7	275 175	° Valve, Pressure Relief, 1600 psi (11.0 MPa)	1
-	275 080	° FILTER ASSEMBLY (See Figure 13)	1
-	275 288	° Drain Valve, Filter Assembly	1
8	940 151	°° O-ring, Viton, 0.56 x 0.69 in.	1
9	900 039	°° Ball	1
10	275 287	°° Body, Drain Valve	1
11	986 601	°° Ring, Retaining, Internal	1
12	275 002	°° Tip, Drain Valve	1
13	982 138	° Screw, Hex Head, M8-1.25 x 40 mm	4
14	983 414	° Washer, Flat, 8 mm	4
-	900 236	° Paste, Teflon	-
15	275 004	° Screw, Filter Bung	1

* Service Kit available. See Table 9.

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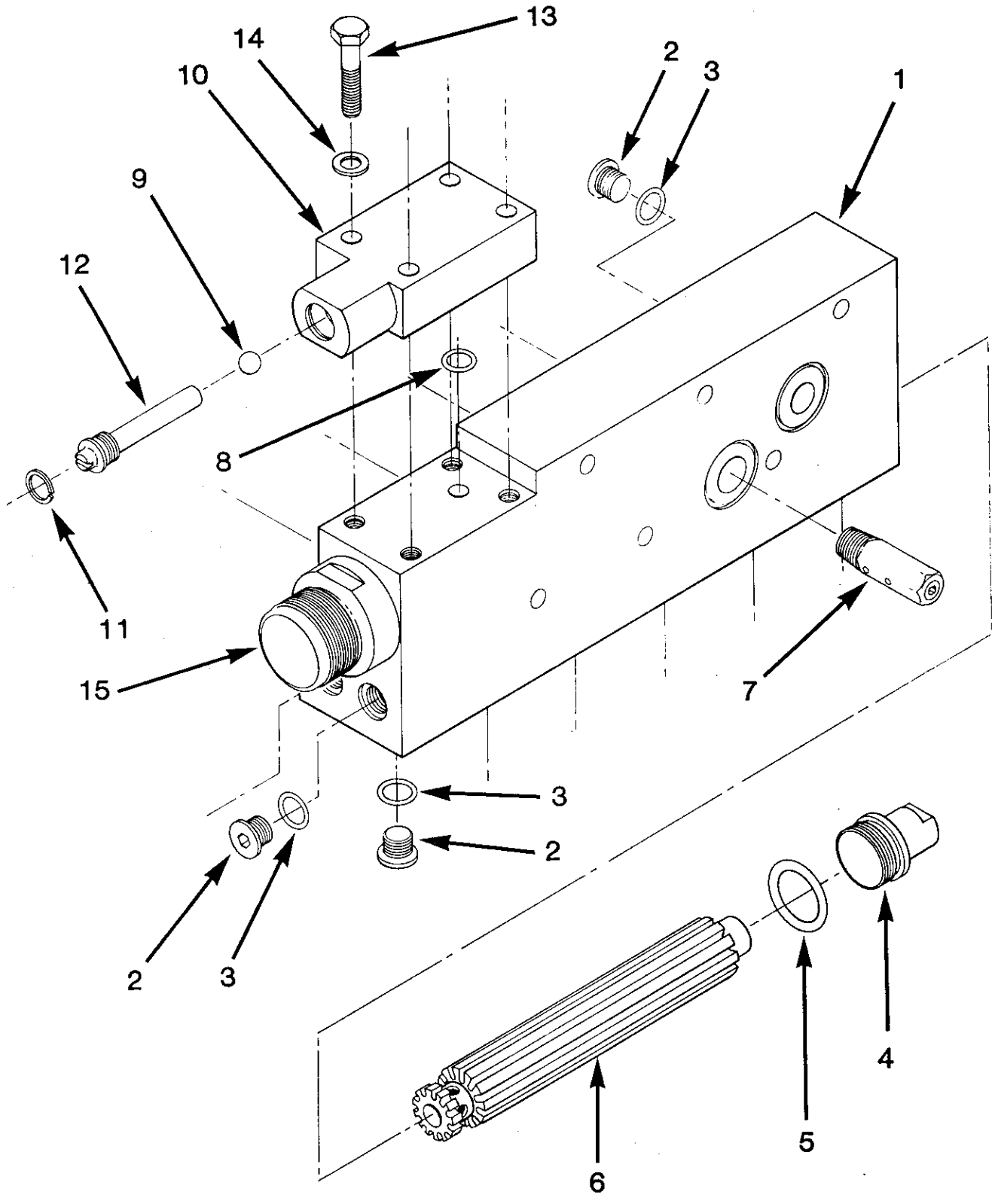

Figure 12 - Manifold Assembly

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FILTER ASSEMBLY PARTS LIST

Item No.	Part No.	Description	Req'd
-	275 486	Filter Assembly	Ref
1	900 236	° Paste, Teflon	-
2	273 140	° Screw, Hex Head, 1/4-20 x 5.75, SPL	1
3	240 459	° Support, Filter	1
4	273 025	° Core, Filter	1
5	161 106	° Screen, .006*	1
6	275 477	° Bung, Filter	1
7	941 230	° O-Ring, Viton	1
8	-	° Cap, Filter	1
9	983 051	° Washer, Flat	1
10	986 013	° Ring, Retaining, Ext.	1
11	982 188	° Screw, Flathead, Soc., M5x16, BL	3
12	275 479	° Handle, Filter	1
13	-	° Driver, Handle	1

* Shipped with Filter Assembly unless otherwise specified on Purchase Order.

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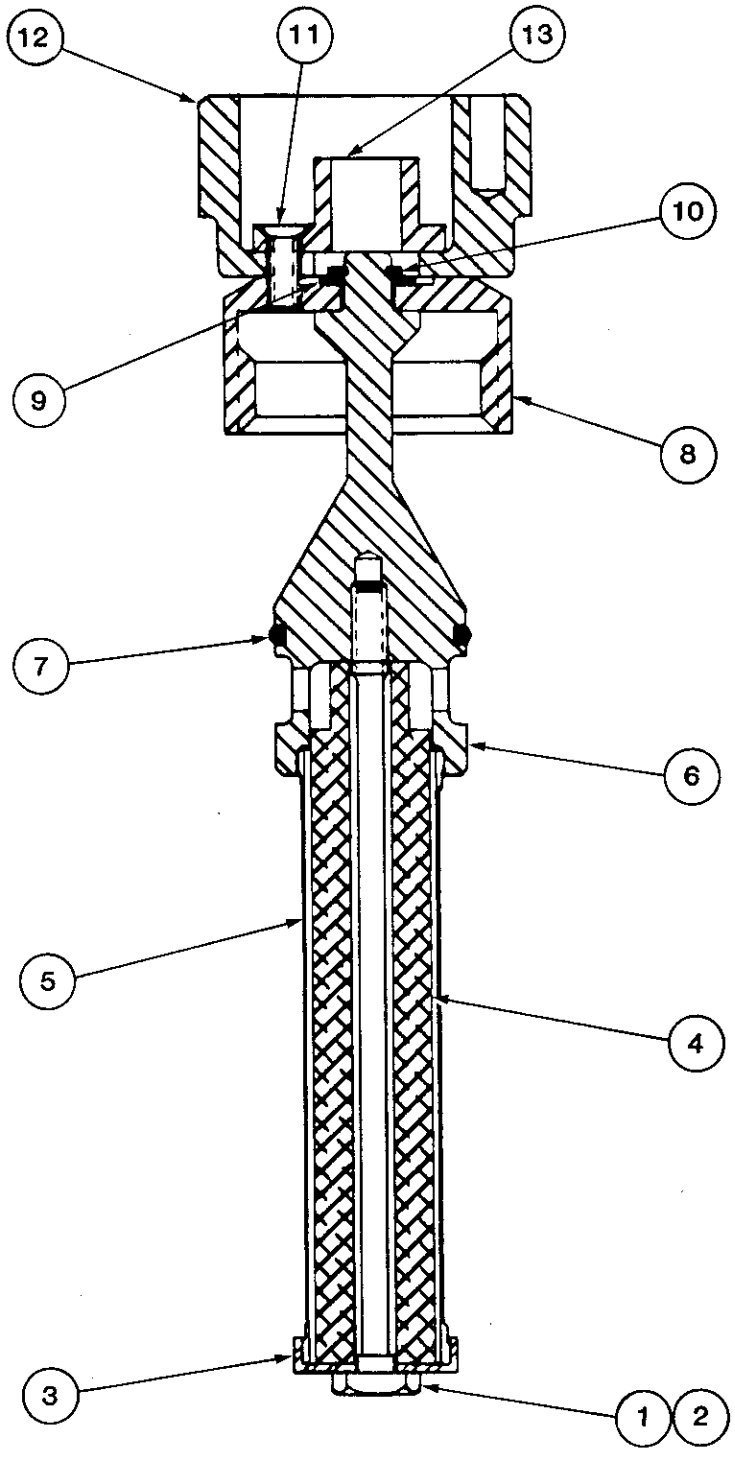

Figure 13 - Filter Assembly

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PUMP ASSEMBLY PARTS LIST - PART 1

Item No.	Part No.	Description	Req'd
-	273 141	Pump Assembly, Air Operated Piston	Ref
1	503 656	° Gasket, Valve	2
2	982 103	° Screw, Hex Head, Cap, M6 x 100 mm	4
3	983 409	° Lockwasher, Split, M6	8
4	273 110	° Head, Air Cylinder, Metric	1
5	955 024	° Gasket. Slab	2
6	504 088	° Cylinder	1
7	984 134	° Locknut, Hex, 1/4-20	1
8	503 687	° Washer, Piston Cup	2
9	503 688	° Washer, Piston Seal	1
10	503 686	° Cup, Piston	2
11	952 100	° Seal, U-Cup, 0.38 x 0.88 in.	1
12	273 109	° Mount, Pump	1
13	981 101	° Screw, Set, Socket Head, 10-32 x 0.19 in.	4
14	240 634	° Ring, Air Valve, Control	1
15	984 534	° Nut, Body Retaining	1
16	983 183	° Tab, Lockwasher	1
17	-	° Piston, Hydraulic (See Service Parts List)	1
18	240 354	° SHIFTER, VALVE (See Figure 16)	1
19	244 244	° VALVE, AIR, 4-WAY (See Figure 15)	1
20	982 104	° Screw, Hex Head, Cap, M6 x 40 mm	4

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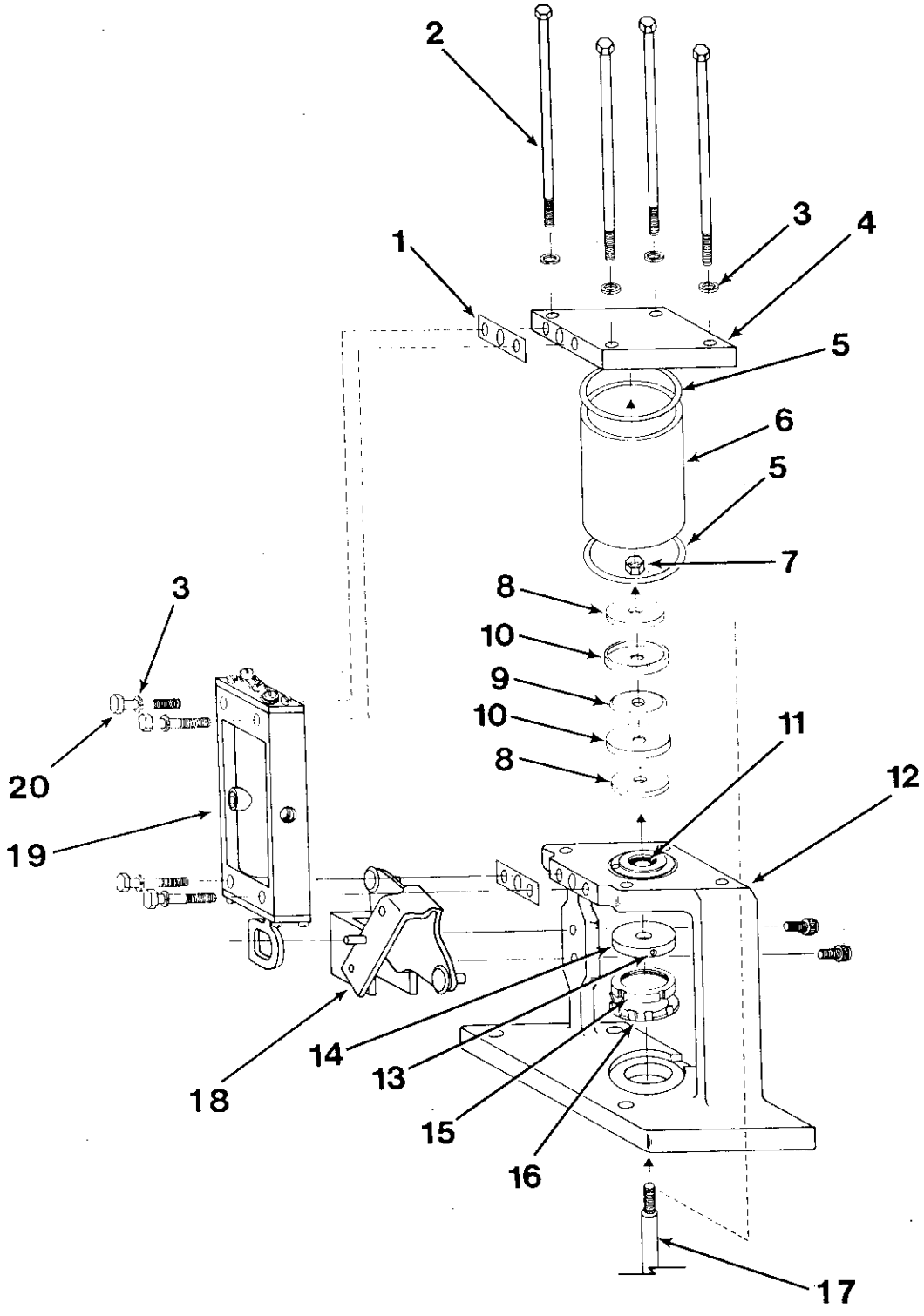

Figure 14 - Piston Pump Assembly (Part 1)

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PUMP ASSEMBLY PARTS LIST - PART 2

Item No.	Part No.	Description	Req'd
-	-	Pump Assembly, Air Operated Piston (continued)	
1	985 307	° Pin, Roll, 0.16 in. dia x 0.50 in. long	1
2	273 108	° Body, Hydraulic Pump	1
3	-	° Piston, Hydraulic (See Service Parts List)	1
-	985 302	° Pin, Roll, 0.12 in. dia x 0.50 in. long	1
4	900 000	° Ball, Pressure, 0.38 in. dia	1
5	-	° Seat, Pressure Ball (See Service Parts List)	1
6*	503 696	° Cage, Ball, Siphon	1
7*	900 001	° Ball, Siphon, 0.50 in. dia	1
8*	-	° Seat, Ball, Siphon (See Service Parts List)	1
-	954 020	° Ring, Backup. 0.50 x 0.62 in.	1
9	940 141	° O-ring, Viton, 0,50 x 0,62 in.	1
10	-	° Tube, Crossover	1
11	973 402	° Plug, Pipe, 1/8-NPT	1
12	273 139	° Wiper, Pump Shaft	1
13	273 138	° Washer, Flat, 0.54 x 0.80 x 0.03 in.	1
14	986 602	° Ring, Retaining, Internal, 0.81 in. bore	1

* Optional high viscosity ball and seat assembly (P/N 503 697) may be used in place of standard ball and seat assembly (P/N 503 691).

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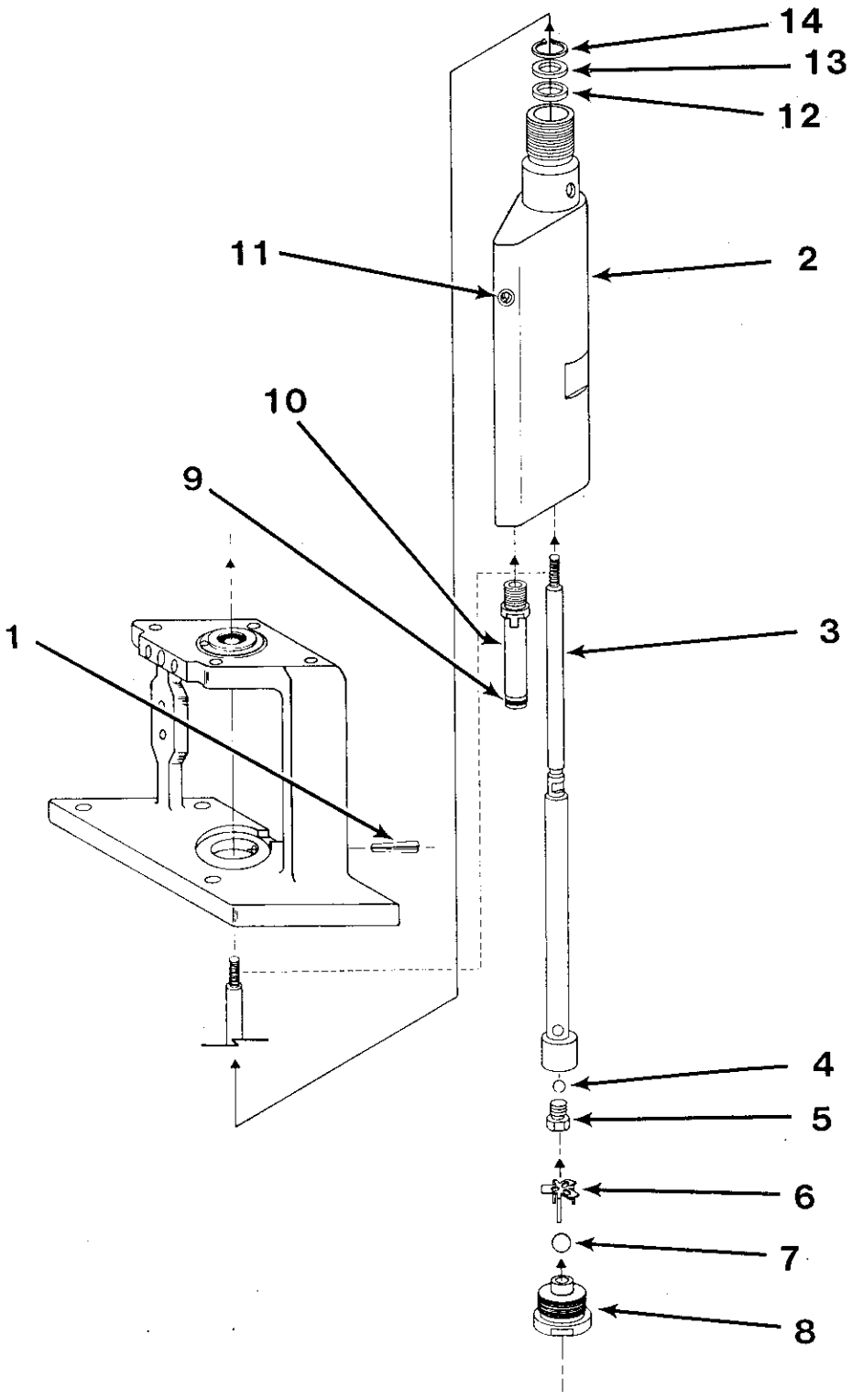

Figure 14 - Piston Pump Assembly (Part 2)

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AIR CONTROL VALVE ASSEMBLY PARTS LIST

Item No.	Part No.	Description	Req'd
-	244 244	Valve. Air Control, 4-Way	Ref
1	981 052	° Screw, 8-32 x 0.62 in., w/Lock Patch	2
2	503 737	° Spacer	2
3	243 512	° Detent	1
4	243 511	° Seat, Poppet	2
5	981 053	° Screw. 8-32 x 0.50 in., w/Lock Patch	6
6	243 515	° Link, Shifter	1
7	243 519	° Pin, Detent	1
8	270 042	° Poppet, Valve	2
9	270 044	° Spool, Valve	1
10	271 360	° Body, Air Control Valve	1
11	973 402	° Plug, Pipe, 1/8-NPTF	1
-	503 656	° Gasket, Valve	4
-	600 138	° Tag, Directions	1

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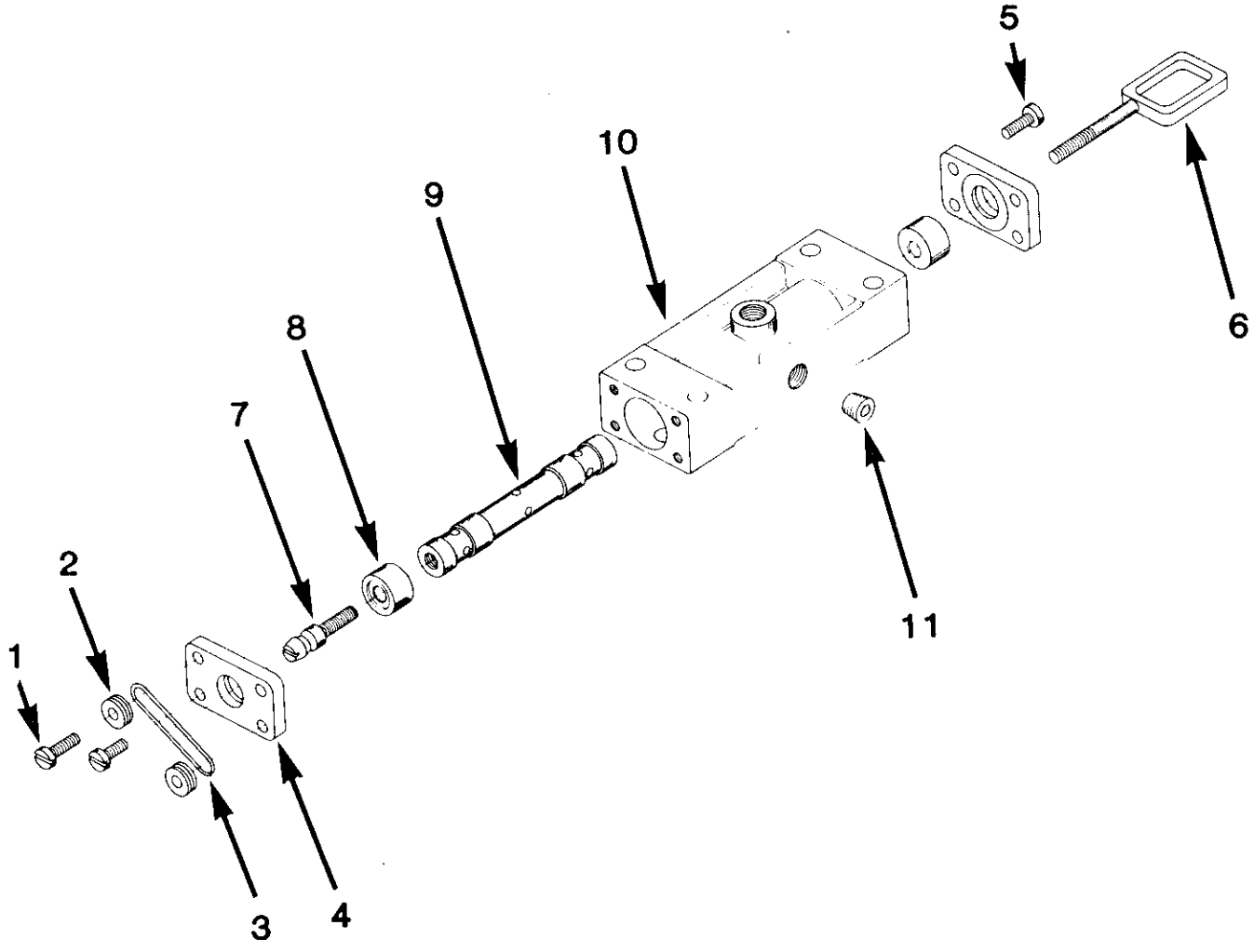

Figure 15 - Air Control Valve Assembly

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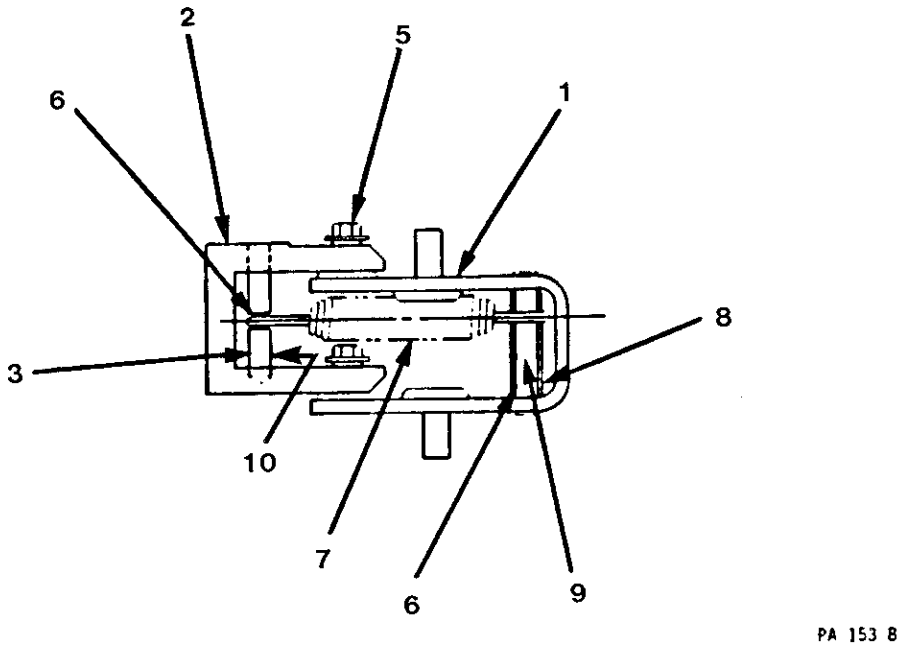

Figure 16 - Pump Valve Shifter Assembly

PUMP VALVE SHIFTER ASSEMBLY PARTS LIST

Item No.	Part No.	Description	Req'd
-	240 354	Valve Shifter, Air Operated Pump	Ref
1	-	° Control Arm Weldment	1
2	503 728	° Bracket, Control Arm	1
3	-	° Pin, Control Arm Bracket	1
4	-	° NOT USED	-
5	981 738	° Screw, Hex Head, 8-32 x 0.25 in.	2
6	-	° Lubricant, Moly Disulfide	-
7	987 002	° Spring	1
8	-	° Sleeve, Control Arm	1
9	-	° Pin, Control Arm	1
10	-	° Sleeve, Control Arm Bracket	1

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PISTON PUMP AIR CONTROL ASSEMBLY PARTS LIST

Item No.	Part No.	Description	Req'd
-	275 071*	Assembly, Air Control, Piston Pump	Ref
1	275 082	° Base Plate, Front	Ref
2	972 200	° Elbow, 90 deg, 1/4-NPT x 9/16-18 37 deg SAE	1
3	901 444	° Regulator, Air Pressure, 1/4-NPT	1
4	973 126	° Elbow, Street, 90 deg, 1/8-NPT	1
5	971 154	° Connector, 1/8-NPT x 1/4 in. Hose Pushon	2
-	933 162	°° Terminal, Pushon	3
6	275 022	° Valve, Solenoid, 230 VAC, 1/8-NPT	1
7	901 253	° Gauge, Pressure, 0 t° 100 psi, 1/8-NPT	1
8	274 423	° Hose, 0.25 in. OD x 7.00 in. long	1
9	-	Not Used	
10	973 503	° Coupling, Pipe, 1/8-NPT	1
11	973 402	° Plug, Pipe, 1/8-NPT, Flush	1
12	972 050	° Connector, Male, 9/16-18 x 1/4-NPT	1
13	973 564	° Nipple, Pipe Hex, 1/4-NPT x 1/8-NPT x 1.19 in.	1
14	973 953	° Adapter, Pipe, 1/8-NPT x 1/4-NPT	1
15	900 236	° Paste, Teflon	-
16	973 151	° Elbow, Street, 90 deg, 1/4-NPT	1

* Optional filter available as Nordson P/N 901 515.

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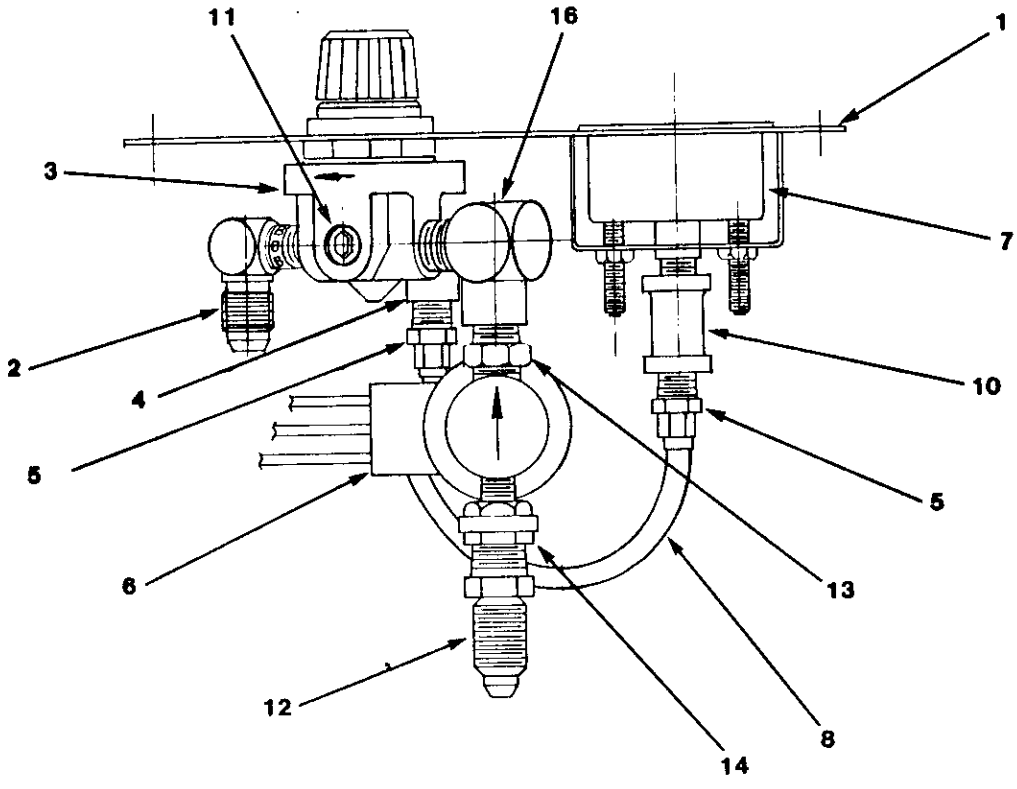

Figure 17 - Piston Pump Air Control Assembly

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AIR OPERATED GEAR PUMP ASSEMBLY PARTS LIST

Item No.	Part No.	Description	Req'd
-	275 333	Drive Assembly, Gear Pump, Air Operated	Ref
1	275 335	° Air Motor	1
2	982 130	° Screw, Set, Cup, M6 x 6 mm	4
3	275 194	° Coupling, 0.50 in. ID x 1.72 in. long	1
4	275 347	° Mount Assembly, Air Motor/Pump	1
-	-	°° Mount, Gear Pump Motor	1
-	901 375	°° Bearing, Needle	1
-	955 051	°° Lip Seal, Viton	1
5	275 202	° Washer, Thrust	2
6	275 341	° Assembly, Pinion Gear	1
-	-	°° Bushing, Assembly, Pinion	1
-	986 315	°° Ring, Retaining, External	1
-	275 109	°° Bearing, Ball	1
7	275 334	° Spacer	4
8	973 576	° Plug, O-Ring, 0.31 in.	1
9	982 029	° Screw, Socket Head, M5 x 30 mm	10
10	983 401	° Lockwasher, Split, M5	10
11	275 172	° Gear, Evoloid. 35-Tooth	1
12	275 343	° Housing Assembly, Gear Reducer	1
-	-	°° Housing, Gear Reducer	1
-	901 374	°° Bearing, Needle	1
-	955 051	°° Seal, Lip, Viton	1
13	275 192	° Key, Woodruff, 0,12 x 0.38 in.	1
14	942 352	° O-ring, Viton	1
15	275 201	° Bearing, Thrust	1
16	973 570	° Plug, Pipe, 1/8-NPT	1
17	275 336	° Shaft Assembly, Output	1
-	-	°° Shaft Output, 9:1 Speed Reducer	1
-	986 315	°° Ring, Retaining, External	1
-	275 109	°° Bearing, Ball	1

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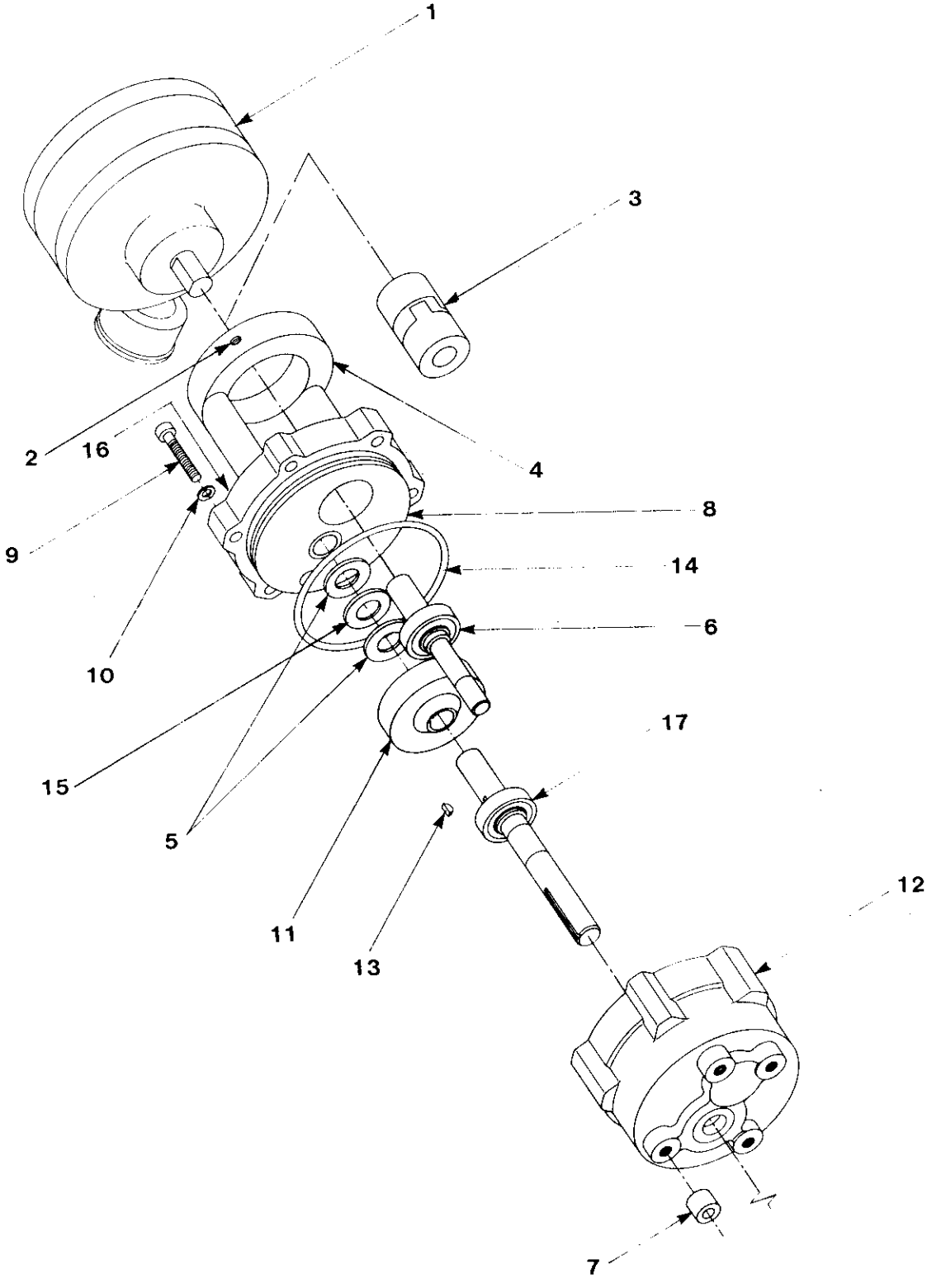

Figure 18 - Air Operated Gear Pump Assembly (Sheet 1 of 2)

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AIR OPERATED GEAR PUMP ASSEMBLY PARTS LIST

Item No.	Part No.	Description	Req'd
1	982 029	° Screw, Socket Head, M5 x 30 mm	10
2	983 401	° Lockwasher, Split, M5	10
3	275 187	° Insert, Coupling	1
4	275 195	° Hub, Coupling	2
5	275 345	° Bracket Assembly, Pump Mount	1
-	-	°° Bracket	1
-	-	°° Ring, Seal, Fixed	1
6	982 131	° Screw, Spline Head, M6 x 25 mm	2
7	275 190	° GEAR PUMP (See Figure 19)	1
8	275 198	° Tube, Crossover	1
9	940 141	° O-ring, Viton, 0.50 x 0.62 in.	1
10	275 191	° Key, Square, 0.12 x 0.50 in. long	2
11	982 133	° Screw, Set, Flat Head, M4 x 6 nm	2
12	275 153	° Valve Assembly, Pressure Control (See Figure 20)	1
13	987 031	° Spring, Compression	1
14	985 227	° Pin, Roll, 0.09 in. dia x 0.38 in. long	1
15	275 197	° Ring, Floating	1
16	275 208	° Seal, Face	1
17	983 409	° Lockwasher, M6	2
18	982 129	° Screw, Hex Head, M6 x 10 mm	2

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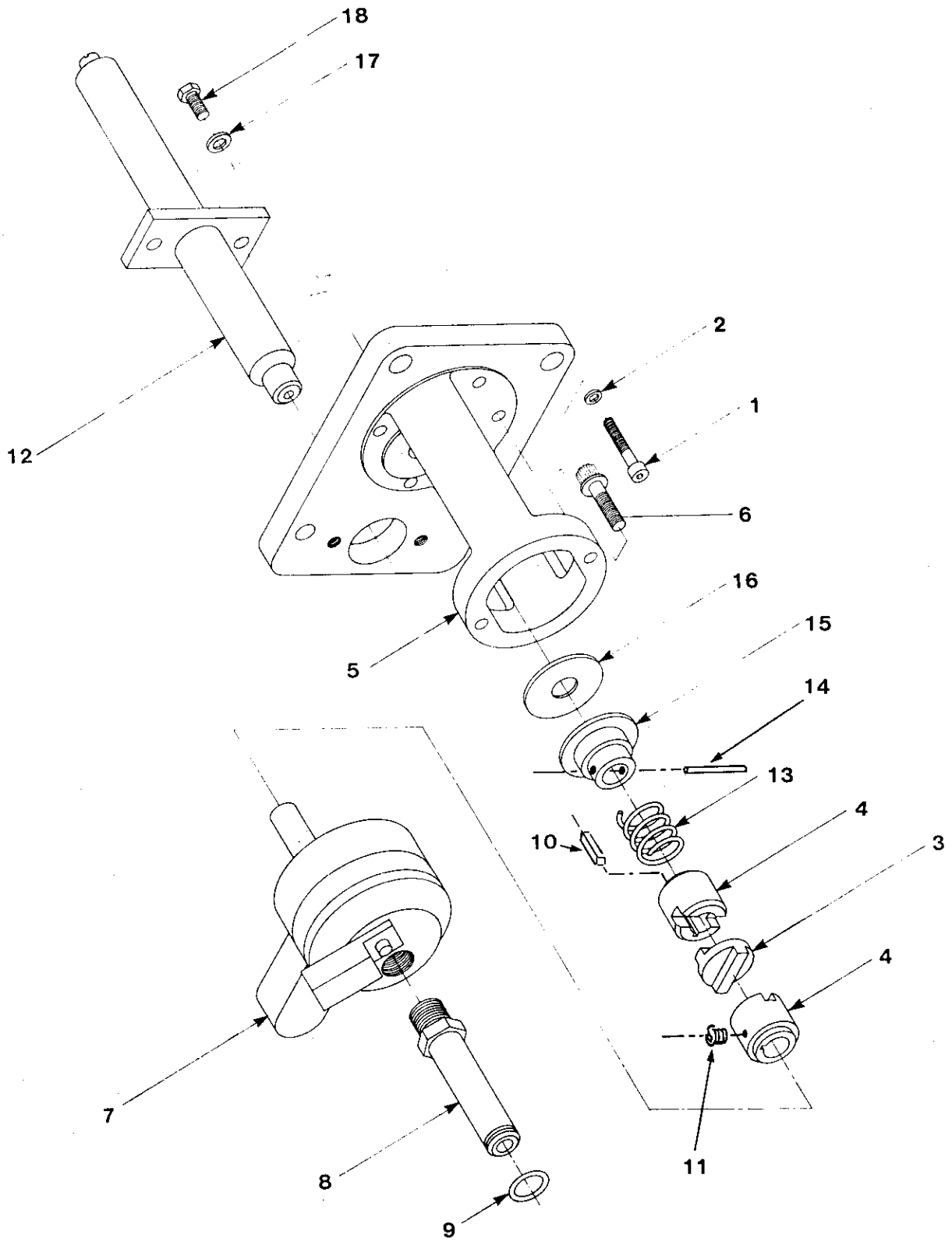

Figure 18 - Air Operated Gear Pump Assembly (Sheet 2 of 2)

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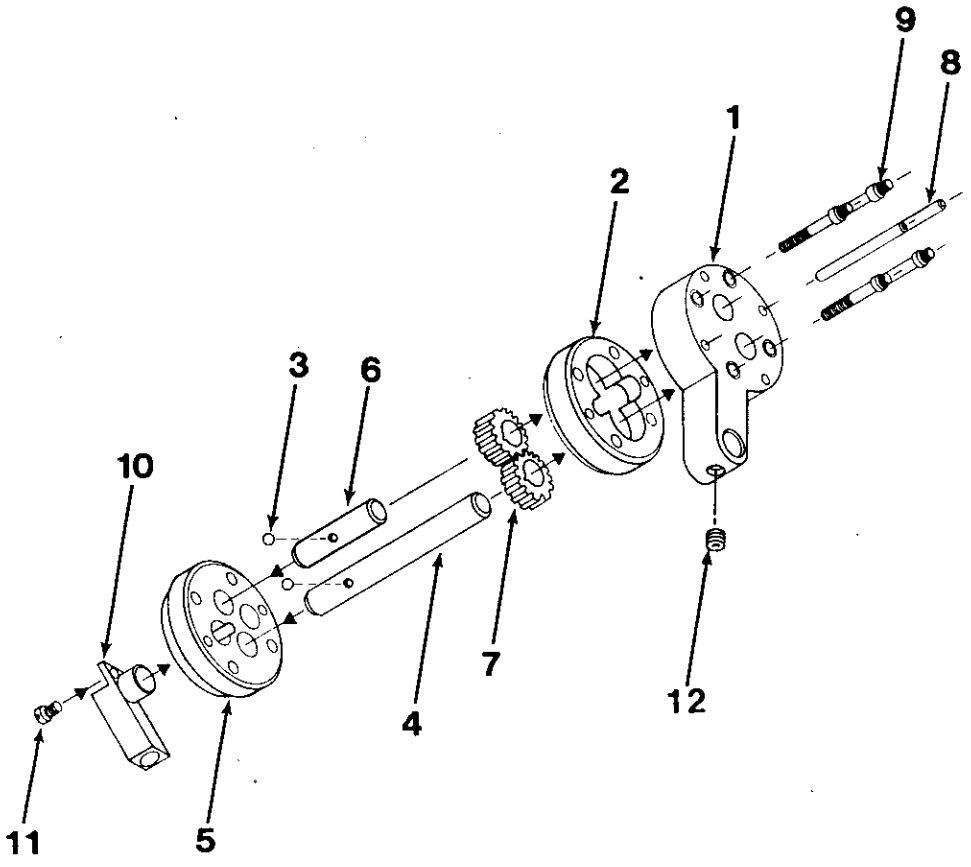

Figure 19 - Gear Pump Assembly

GEAR PUMP ASSEMBLY PARTS LIST

Item No.	Part No.	Description	Req'd
-	275 190	Pump, Gear	Ref
1	-	° Plate, Pump, Upper	1
2	-	° Plate, Pump, Center	1
3	900 013	° Ball, Steel, 0.12 in. dia	2
4	275 181	° Shaft, Input	1
5	-	° Plate, Pump, Lower	1
6	275 179	° Shaft, Idler	1
7	275 178	° Gear, Spur, 14 Teeth	2
8	985 226	° Pin, Dowel, 0.19 in. dia x 1.50 in. long	2
-	973 403	° Plug, Pipe, 1/16-NPTF	1
9	982 132	° Screw, Spline Head, M6 x 40 mm	4
-	900 236	° Paste, Teflon	-
10	275 173	° Tube, Inlet	1
11	982 003	° Screw, Fillister Head, M3 x 8 mm	1
12	973 403	° Plug, Pipe, 1/16 NPTF	1

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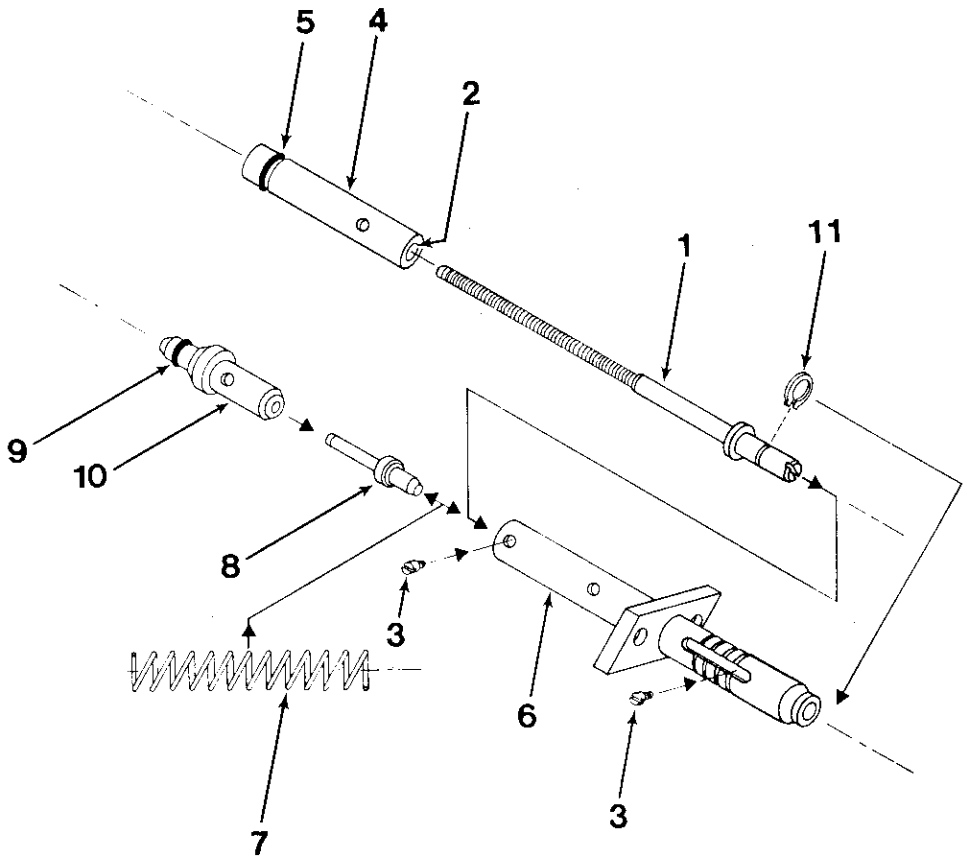

Figure 20 - Pressure Control Valve Assembly

PRESSURE CONTROL VALVE ASSEMBLY PARTS LIST

Item No.	Part No.	Description	Req'd
-	275 153	Valve Assembly, Pressure Control	Ref
1	275 151	° Adjuster, Pressure Control Valve	1
2	940 111	° O-ring. Viton, 0.31 x 0.44 in.	1
3	275 217	° Screw, Pan Head M5-0.8 x 5 mm	2
4	275 150	° Slide, Pressure Adjust	1
5	941 133	° O-ring, Viton, 0.56 x 0.75 in.	1
6	275 159	° Tube Assembly, Pressure Control Valve	1
-	-	°° Cap, Pressure Control Valve	1
-	-	°° Tube, Pressure Control Valve	1
-	-	°° Plate, Mounting	1
7	987 025	° Spring, Compression	1
8	275 207	° Stem, Pressure Control Valve	1
9	940 141	° O-ring, Viton, 0.50 x 0.62 in.	1
10	275 158	° Nose, Pressure Control Valve	1
-	900 303	° Lubricant, Silicon, High Temperature	-
11	986 007	° Ring, Retaining	1

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GEAR PUMP AIR CONTROL ASSEMBLY PARTS LIST

Item No.	Part No.	Description	Req'd
-	275 072*	Assembly, Air Control, Gear Pump	Ref
1	275 082	° Base Plate, Front	Ref
2	972 200	° Elbow, 90 deg, 1/4-NPT x 9/16-18 37 deg SAE	1
3	901 444	° Regulator, Air Pressure, 1/4-NPT	1
4	073 126	° Elbow, Street, 90 deg, 1/8-NPT	1
5	971 154	° Connector, 1/8-NPT x 1/4 in. Hose Pushon	2
6	275 021	° Valve, Solenoid, 230 VAC, 1/4-NPT	1
-	933 162	°° Terminal, Pushon	3
-	931 014	°° Wire, 18 GA, Black	3.7 ft
-	-	°° Wire, 18 GA, Green w/Yellow	1.8 ft
7	901 253	° Gauge, Pressure, 0 t° 100 psi, 1/4-NPT	1
8	274 423	° Hose, 0.25 in. OD x 7.00 in. long	1
9	-	Not Used	-
10	973 503	° Coupling, Pipe, 1/8-NPT	1
11	973 402	° Plug, Pipe, 1/8-NPT, Flush	1
12	972 050	° Connector, Male, 1/4-NPT x 9/16-18	1
13	973 037	° Nipple, Pipe, 1/4-NPT x 1.45 in.	1
15	900 236	° Paste, Teflon	-
16	973 151	° Elbow, Street, 90 deg, 1/4-NPT	1

*Optional filter-lubricator available as Nordson P/N 273 740. Filter is P/N 901 515; lubricator is P/N 901 514.

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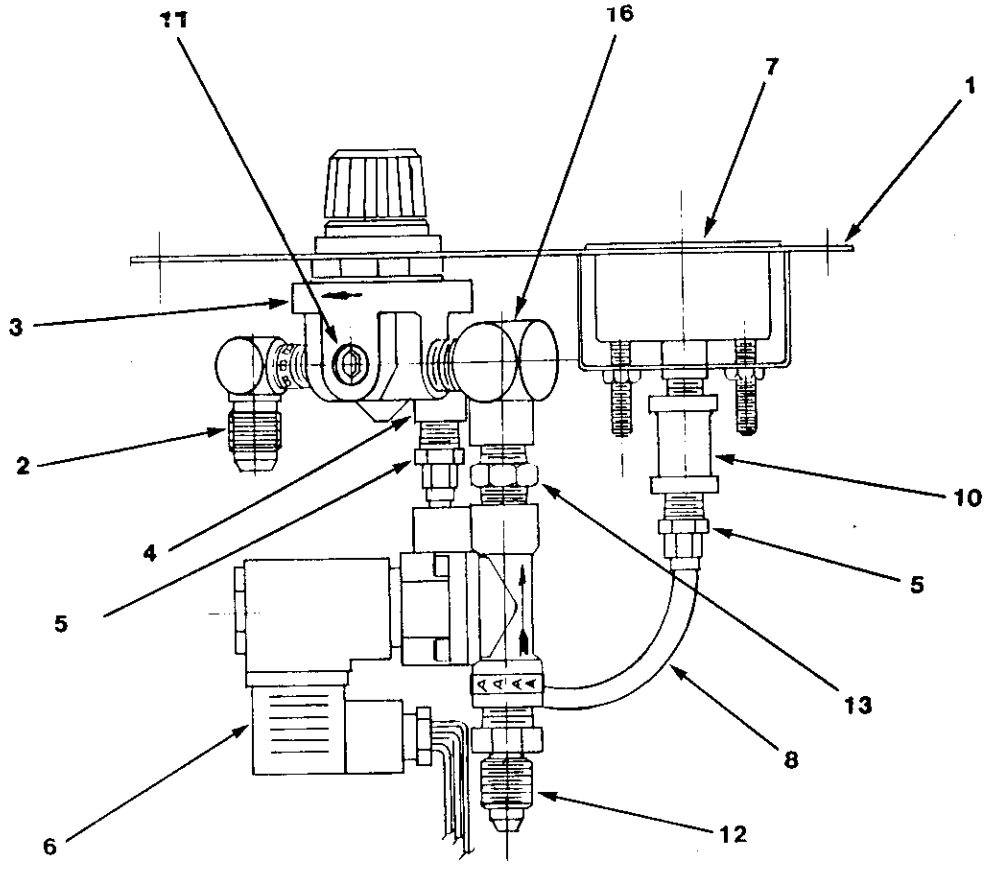

Figure 21 - Gear Pump Air Control Assembly

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TABLE 6 - OPTIONAL FILTER SCREENS

Part Number	Description
161 104	Screen, Filter, 0.004 in. mesh
161 106*	Screen, Filter, 0.006 in. mesh
161 109	Screen, Filter, 0.009 in. mesh
161 112	Screen, Filter, 0.012 in. mesh
161 115	Screen, Filter, 0.015 in. mesh
161 120	Screen, Filter, 0.020 in. mesh

*Shipped with applicator unless specified otherwise on Purchase Order.

TABLE 7 - RECOMMENDED SPARE PARTS LIST

Part No.	Description	Qty
	MANIFOLD AND TANK	
275 035	Gasket, Tank (2002/2004)	1
275 036	Gasket, Tank (2202/2204)	1
275 080	Filter Assembly	1
941 230	° O-ring, Viton, 1.19 x 1.38 in.	1
*	° Screen, Filter	2
945 035	O-ring, Viton, 7/8 in. OD Tube (Heat Exchanger)	1
275 175	Valve, Pressure Relief, 1600 psi (11.0 MPa)	1
940 141	O-ring, Viton (Crossover Tube)	1

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TABLE 7 - RECOMMENDED SPARE PARTS LIST (Continued)

Part No.	Description	Qty
	PISTON PUMP ASSEMBLY	
244 376	Seal Kit, Pump	1
503 656	° Gasket, Valve	4
503 686	° Cup, Piston	2
952 100	° Cup, U, Viton	1
955 024	° Gasket, Slab	2
244 244	Valve, 4-Way Air Control	1
273 139	Wiper, Pump Shaft	1
240 354	Shifter, Valve	1
273 141	Piston Pump Assembly	1
986 602	Ring, Retainer	1
243 511	Seat, Poppet	2
273 138	Washer, Special	1
940 141	O-ring	1
954 020	Backup Ring	1
	GEAR PUMP ASSEMBLY	
275 188	Rotary Air Motor	1
275 190	Gear Pump	1
275 371	Rebuild Kit, Gear Pump	1
275 153	Pressure Control Valve	1
955 051	Lip Seal, Viton	1
	ELECTRICAL	
937 277	Sensor, Tank Temperature, RTD	1
937 281	Thermostat, Close-on-Rise, 500°F (260°C)	1
273 013	Circuit Breaker, Main, 3-pole, 30 amp	1
939 533	Circuit Breaker, Hose, 10 amp, thermal	1
939 532	Circuit Breaker, Gun, 10 amp, magnetic (2004/2204)	1
939 631	Circuit Breaker, 5 Amp (2002/2202)	1
939 577	Lamp, Indicator, White, 230 VAC	1

* See Table 6 for optional filter screens.

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TABLE 7 - RECOMMENDED SPARE PARTS LIST (Continued)

Part No.	Description	Qty
939 574	Temperature Control Board (2004/2204)	1
939 575	Potentiometer Board (2004/2204)	1
275 128	Temperature Control Board (2002/2202)	1
275 129	Potentiometer Board (2002/2202)	1
939 538	Solid-State Relay, 25 amp (2002/2004)	1
939 576	Solid-State Relay, 40 amp (2202/2204)	1
939 541	Base, Connector Mounting	1
	AIR CONTROL ASSEMBLY	
901 253	Pressure Gauge, 0 to 100 psi, 1/8-NPT	1
275 022	Solenoid Valve, 230 VAC, 1/8-NPT (Piston Pump Only)	1
275 021	Solenoid Valve, 230 VAC, 1/8-NPT (Gear Pump Only)	1
	MISCELLANEOUS	
275 338	Lubricant, Gear Reducer (Gear Pump Only)	1
900 236	Paste, Teflon	1
900 252	Lubricant, Piston Pump Valve Shifter	1
902 514	Gloves	1

TABLE 8 - SHIP WITH PARTS LIST

Part No.	Description	Qty
-	Kit, Ship With, Piston Pump	-
939 579	° Cable Tie, Red	1
981 235	° Screw, Hex Head, 1/4-20 x 4.0 in.	1
-	Kit, Ship With, Gear Pump	-
939 579	° Cable Tie, Red	1
275 338	° Lubricant, Gear Reducer	1
981 235	° Screw, Hex Head, 1/4-20 x 4.0 in.	1

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TABLE 9 - SERVICE PARTS LIST

Part No.	Description	Qty
275 073	Kit, Hose Bracket	1
275 211	Tank w/Tag, Model 2002/2004	1
275 212	Tank w/Tag, Model 2202/2204	1
275 371	Kit, Rebuild, Gear Pump	1
274 126	Tool, Crimp Socket Removal	1
275 329	Lid Assembly w/Retainer	1
901 515	Filter, Air, 1/4-NPT	1
275 324	Kit, Door Latch, Key-Type	1
240 829	Crossover Tube Assembly	1
240 635	Piston, Pump Hydraulic	1
503 694	Seat Assembly, Siphon Ball	1
503 697	Seat Assembly, Large Siphon Ball	1
503 708**	Seat Assembly, Pressure Ball	1
275 309	Manifold Assembly for applicators before and including serial numbers listed below*	1
275 312	Manifold Assembly for applicators after serial numbers listed below*	1
274 463	Kit, Hose Connector	1
275 353	Kit, Drive Shaft Replacement	1
275 388	Kit, Piston-to-Gear Pump Interchange, 2002/2004	1
275 389	Kit, Gear-to-Piston Pump Interchange, 2002/2004	1
275 384	Kit, Piston-to-Gear Pump Interchange, 2202/2204	1
275 385	Kit, Gear-to-Piston Pump Interchange, 2202/2204	1

*MANIFOLD IDENTIFICATION CHART
(All units after this serial number use manifold P/N 275 312)

Unit Part Number	Serial Number
275 014	A3K07955
275 144	A3K06239
275 273	A3K08428
275 274	A3L01204
275 013	A3K08188
275 145	A3L06608
275 275	A3L02554
275 276	A3L02562

** Optional high viscosity ball and seat assembly (P/N 503 697) may be used in place of standard ball and seat assembly (P/N 503 694).

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APPENDIX A

RIGHT TO LEFT SIDE CONVERSION
SERIES 2000

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APPENDIX A

RIGHT TO LEFT SIDE CONVERSION SERIES 2000

INTRODUCTION

The Nordson Series 2000 hot melt applicators are shipped from the factory with the manifold on the right side of the applicator as the standard configuration. Because some applications require that hoses be routed from the left side of the applicator, a conversion of temperature, electrical, and pneumatic controls must be made. To facilitate this conversion, the heat sink at the back of the unit is interchangeable with the electrical and temperature controls. The pneumatic control panel is also interchangeable with the information plate on the back of the unit.

Additionally, the tank lid hinge can be relocated such that the lid will open to the left or to the right as required by the application.

The following paragraphs detail the conversion procedure to convert the applicator to a left side unit.

PNEUMATIC CONTROL PANEL RELOCATION

1. Remove four screws and slide the pneumatic control panel out of the applicator until the solenoid valve is exposed.

2. Disconnect the pneumatic hoses from the regulator and solenoid valve connections.

3. Unplug the electrical connector on the solenoid coil or disconnect wiring at TB2.

4. Remove the information plate from the back of the applicator by removing four screws.

5. Slide the air control assembly into the back of the applicator until the solenoid valve electrical connection can be plugged into the coil or the wires can be connected at TB2.

6. Attach the pneumatic hoses to the regulator and solenoid valve.

⊘ Attach the input hose to the solenoid valve and the output hose to the regulator. If the input hose is inadvertently connected to the regulator, no air will flow to the air motor.

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7. Slide the assembly all the way into the applicator base and secure with four screws.

8. Attach the information plate to the front of the applicator base and secure with four screws.

ELECTRICAL AND TEMPERATURE CONTROL PANEL RELOCATION

1. Remove the top electrical enclosure by removing three captive screws.

2. Remove the input terminal block support bracket from the electrical subplate by removing two screws.

3. Carefully unplug the ribbon connector from the temperature control board.

4. Cut and remove the red cable tie from the wire harness.

   NOTE: Removal of this cable tie permits the temperature and electrical control panel to be interchanged with the heat sink panel without disturbing the main wiring harness.

5. Remove the electrical and temperature control panel from the electrical subplate by removing two screws.

6. Remove the main circuit breaker insulator by removing two screws and lockwashers.

7. Remove the heat sink assembly panel from the electrical subplate by removing two screws.

8. Secure the input terminal block support bracket to the subplate using two screws in the holes provided between terminal block TB2 and the front of the unit.

9. Move the heat sink assembly panel to the front of the applicator and secure with two screws.

10. Attach the main circuit breaker insulator to the subplate using two screws and lockwashers.

11. Attach the electrical and temperature control panel to the rear of the subplate using two screws.

12. Secure the wire harness together using the red cable tie supplied with the applicator.

13. Carefully plug in the ribbon connector on the temperature control board.

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Pins on the ribbon connector are easily broken and bent. Use caution not to push the plug onto the board until all pins are aligned with the plug.

14. Carefully check that no wires are pinched under brackets or pulled too tightly. Check all terminal connections for tightness.

Pinched or broken wiring and loose electrical connections can cause erratic system operation, damage to the equipment, and severe electrical shock.

15. Install the top electrical enclosure on the applicator and secure with three captive screws.

16. Install the applicator in accordance with Section II, Preparation For Use.

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APPENDIX B

SERIES 2000 PISTON-TO-GEAR PUMP CONVERSION

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APPENDIX B
SERIES 2000 PISTON-TO-GEAR PUMP CONVERSION

The Series 2000 Piston-to-Gear Pump Kits (P/N 275 388 (2002/2004) and 275 384 (2202/2204)) include the parts required to convert a piston pump Series 2000 applicator to an air-operated gear pump applicator (See Parts List). To accomplish the conversion, refer to Figure 1 and follow this procedure:

1. Check to be sure the adhesive in the tank is molten.

2. Turn the main switch OFF and disconnect and lock out input electrical power.

The Series 2000 hot melt applicators contain energized electrical components with potentials that could be fatal. Disconnect and lock out input electrical power before removing any panels.

Wear safety glasses, safety gloves (P/N 902 514), and protective clothing to prevent injury from hot applicator parts and surfaces.

3. Remove the cover (1) and disconnect the air line connected to the four way air valve (2).

4. Remove the three M8 bolts (3) securing the pump to the unit and remove the pump. Remove the strainer from the tank.

5. Remove the FRP electrical enclosure (4) and tank enclosure (5).

6. Mount the air motor and gear pump assembly (P/N 275 333) on the unit. DO NOT insert the mounting bolts at this time.

7. Attach the incoming air line to the port (6) on the air motor.

   NOTE: Be sure the incoming air is connected to the port nearest the tank.

   NOTE: The air supply to the air motor must be lubricated.

8. Mount the exhaust manifold (7) at the tapped holes in the base using the screws (8) and lockwashers (9) provided. Attach the muffler (13) to the manifold.

9. Using the ell (10) and connector (11) as shown, connect the copper tubing (12) to the muffler manifold and air motor.

10. Insert the three M8 bolts removed in Step 4 through the mounting plate on the gear pump assembly. Tighten the bolts. Place the strainer included in the kit in the tank.

11. Remove the four M5 screws securing the air control assembly (14) to the front of the unit and pull the assembly out approximately 5 inches.

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12. Disconnect solenoid leads S1, S2, and S3 from TB2 and the ground stud and remove the solenoid valve. Note the locations of all connections. (See Figure 2)

13. Install the solenoid valve, nipple, and connector included in the kit. All connections are identical to those found in Step 12. (See Figure 2)

14. Replace the air control assembly, tank cover, lid, electrical enclosure, and upper enclosure.

15. Remove the plastic plug from the top of the gear reducer housing.

16. Carefully remove the pipe plug from the side of the gear reducer housing.

    NOTE: Lubricant should be at the level of the plug hole in the side of the unit. If the gear reducer is full, allow the unit to drain to the level of the plug hole. If the level is low, refill to the level of the plug hole using the lubricant (P/N 275 338) included in the kit.

⊘ If the gear reducer is overfilled, the energy used in churning the excess oil can result in overheating. If the gear reducer is underfilled, the resultant friction can also cause overheating.

17. Replace the pipe plug in the side of the housing. Use PTFE paste (P/N 900 236) on the threads.

18. Install the vent plug in the plastic bag in the place of the plastic plug. Use teflon paste on the threads.

19. Replace the cover and restore the applicator to normal operation.

Part No.	Description	Req'd
275 388	Kit, Pump, Piston-to-Gear, 2002/2004	Ref
275 384	Kit, Pump, Piston-to-Gear, 2202/2204	Ref
275 333	° Gear Pump Drive Assembly	1
275 021	° Solenoid Valve	1
973 037	° Nipple	1
273 041	° Strainer (with P/N 275 388 only)	1
273 142	° Strainer (with P/N 275 384 only)	1
971 501	° Ell	1
275 278	° Copper Tubing	1
971 250	° Connector	1
275 277	° Exhaust Manifold	1
982 001	° Screw	2
983 401	° Lockwasher	2
275 338	° Lubricant	1

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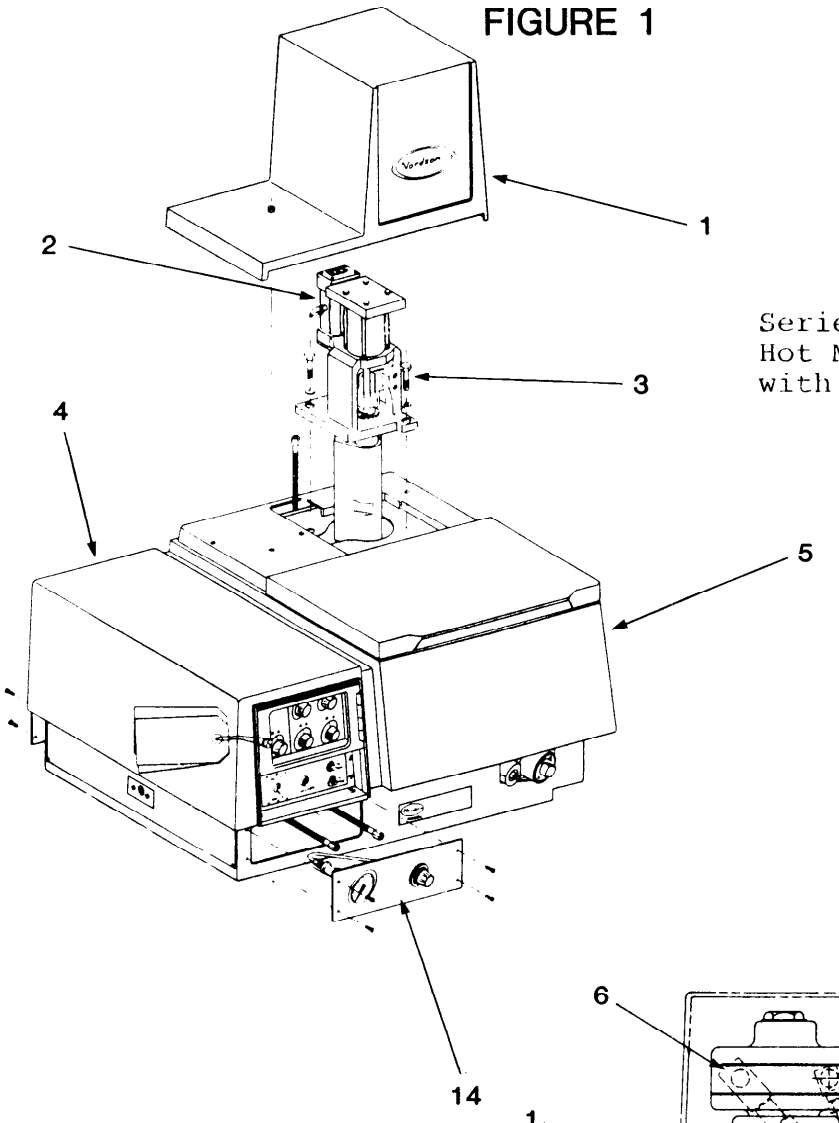
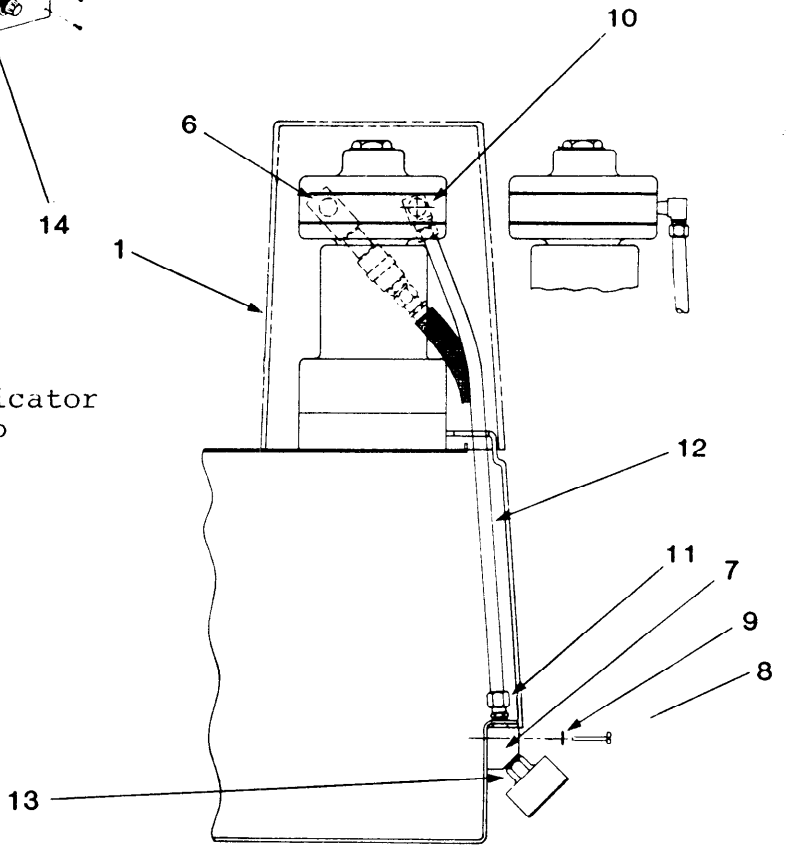
FIGURE 1



Series 2000
Hot Melt Applicator
with Piston Pump



Series 2000
Hot Melt Applicator
with Gear Pump

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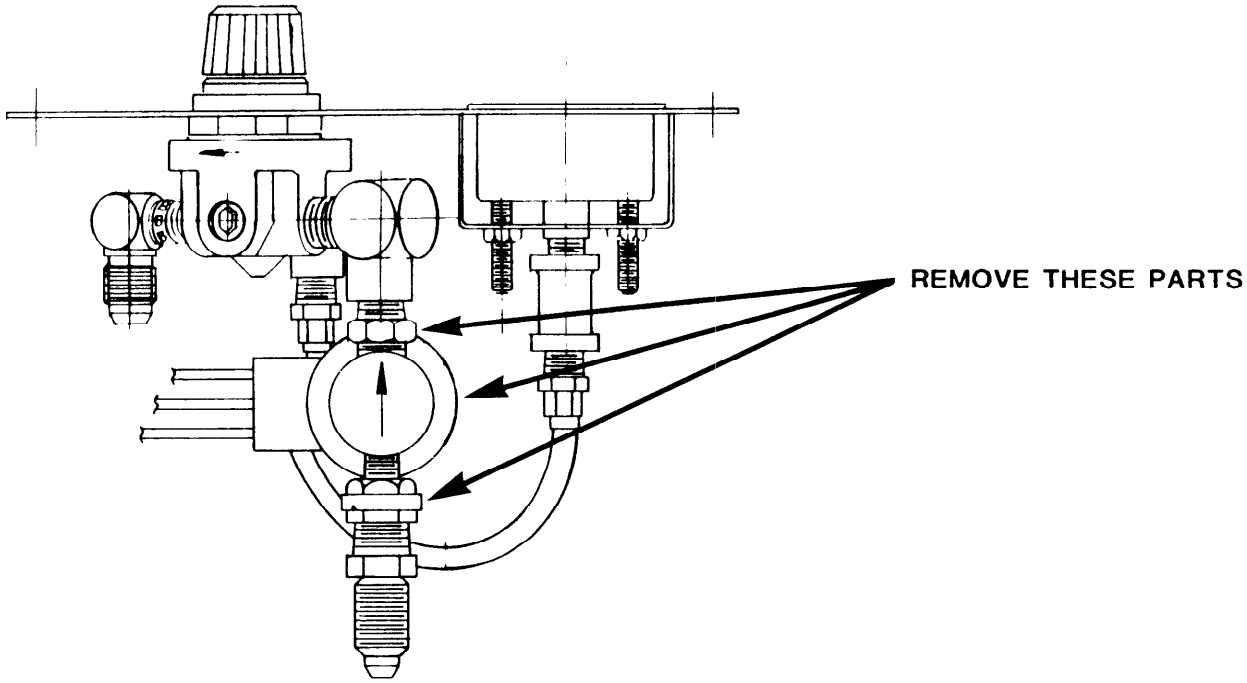
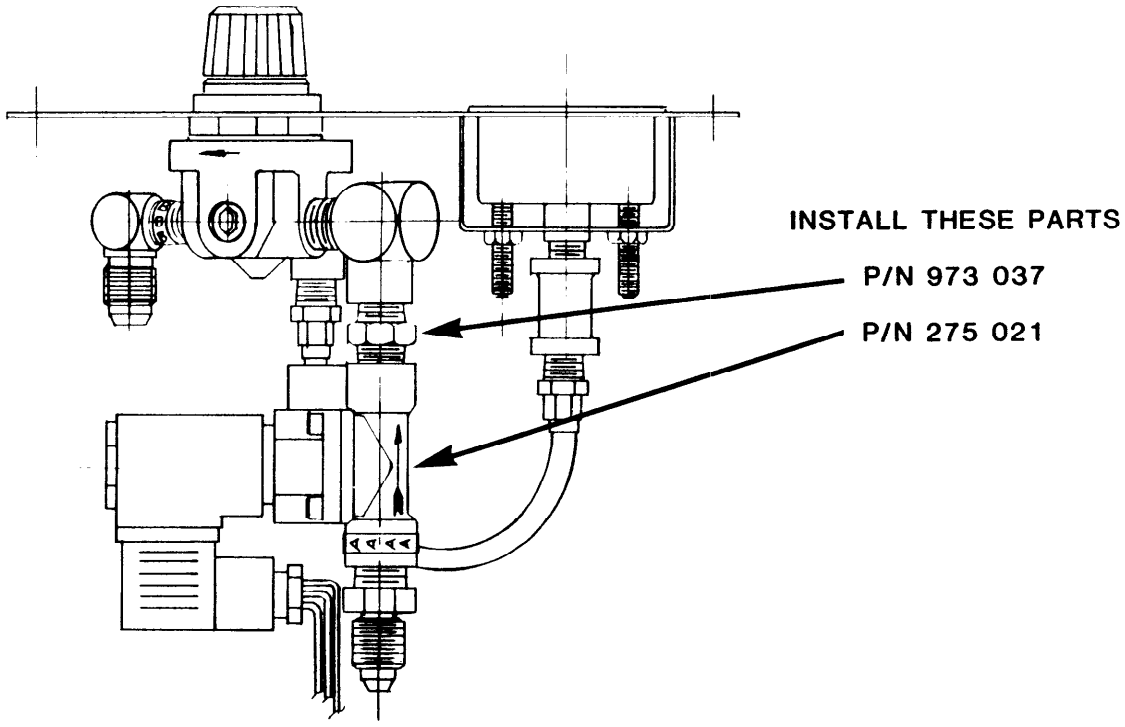
FIGURE 2



PISTON PUMP AIR CONTROL ASSEMBLY



GEAR PUMP AIR CONTROL ASSEMBLY

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Series 2000 Gear-to-Piston Pump Conversion

Appendix C

EDB No. 41-2000

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APPENDIX C
SERIES 2000 GEAR-TO-PISTON PUMP CONVERSION

The Series 2000 Gear-to-Piston Pump Kits (P/N 275 389 (2002/2004) and P/N 275 385 (2202/2204)) include the parts required to convert an air-operated gear pump Series 2000 applicator to a piston pump applicator (See Parts List). To accomplish the conversion, refer to Figure 1 and follow this procedure:

1. Check to be sure the adhesive in the tank is molten.

2. Turn the main switch OFF and disconnect and lock out input electrical power.

The Series 2000 hot melt applicators contain energized electrical components with potentials that could be fatal. Disconnect and lock out input electrical power before removing any panels.

Wear safety glasses, safety gloves (P/N 902 514), and protective clothing to prevent injury from hot applicator parts and surfaces.

3. Remove the cover (1), the FRP electrical enclosure (2), and the tank enclosure (3) and disconnect the air line (4) connected to the gear pump air motor.

4. Disconnect the copper tubing (5) from the muffler manifold (6) by loosening the connector (7).

5. Remove the three M8 bolts securing the pump to the unit and remove the pump. These bolts (8) are in the same locations that will be used to mount the piston pump. Remove the strainer from the tank.

6. Mount the piston pump assembly (P/N 273 141) on the unit. Insert and tighten the three mounting bolts (8).

7. Attach the incoming air line (9) to the four-way air valve (10) using the reducer adapter (P/N 973 953) shipped with the kit.

8. Place the new strainer in the tank.

9. Replace the cover, electrical enclosure, and tank enclosure and restore the applicator to normal operation.

Part No.	Description	Req'd
275 389	Kit, Pump, Gear-to-Piston, 2002/2004	Ref
275 385	Kit, Pump, Gear-to-Piston, 2202/2204	Ref
273 143	° Strainer, Tank (with P/N 275 389 only)	1
273 042	° Strainer, Tank (with P/N 275 385 only)	1
973 953	° Adapter, Reducer	1

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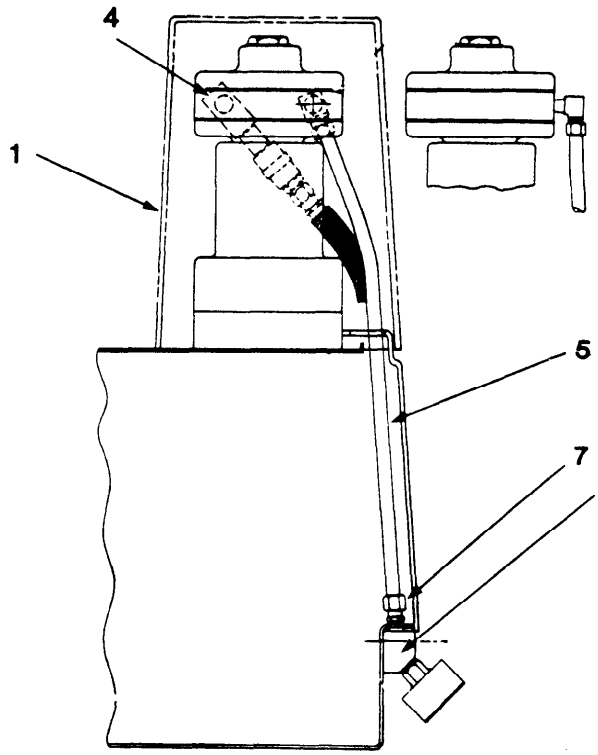
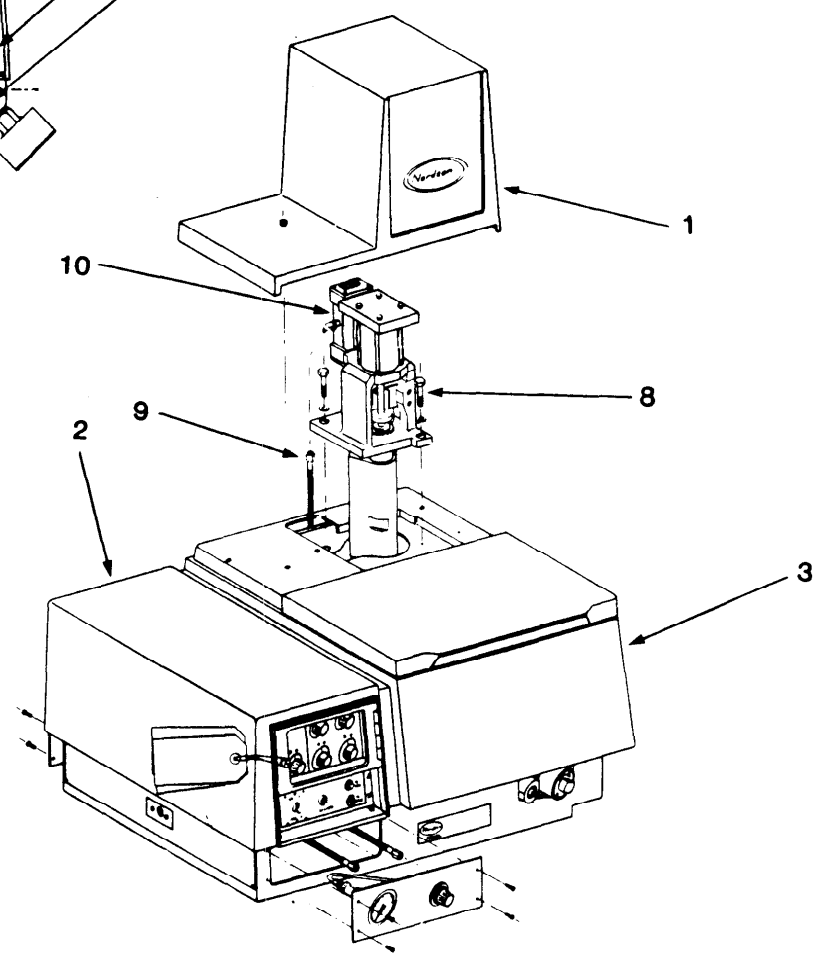


Series 2000
Hot Melt Applicator
with Gear Pump



Series 2000
Hot Melt Applicator
with Piston Pump

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GENERAL INFORMATION

ISSUED 6/81 SUPERSEDES 4/79

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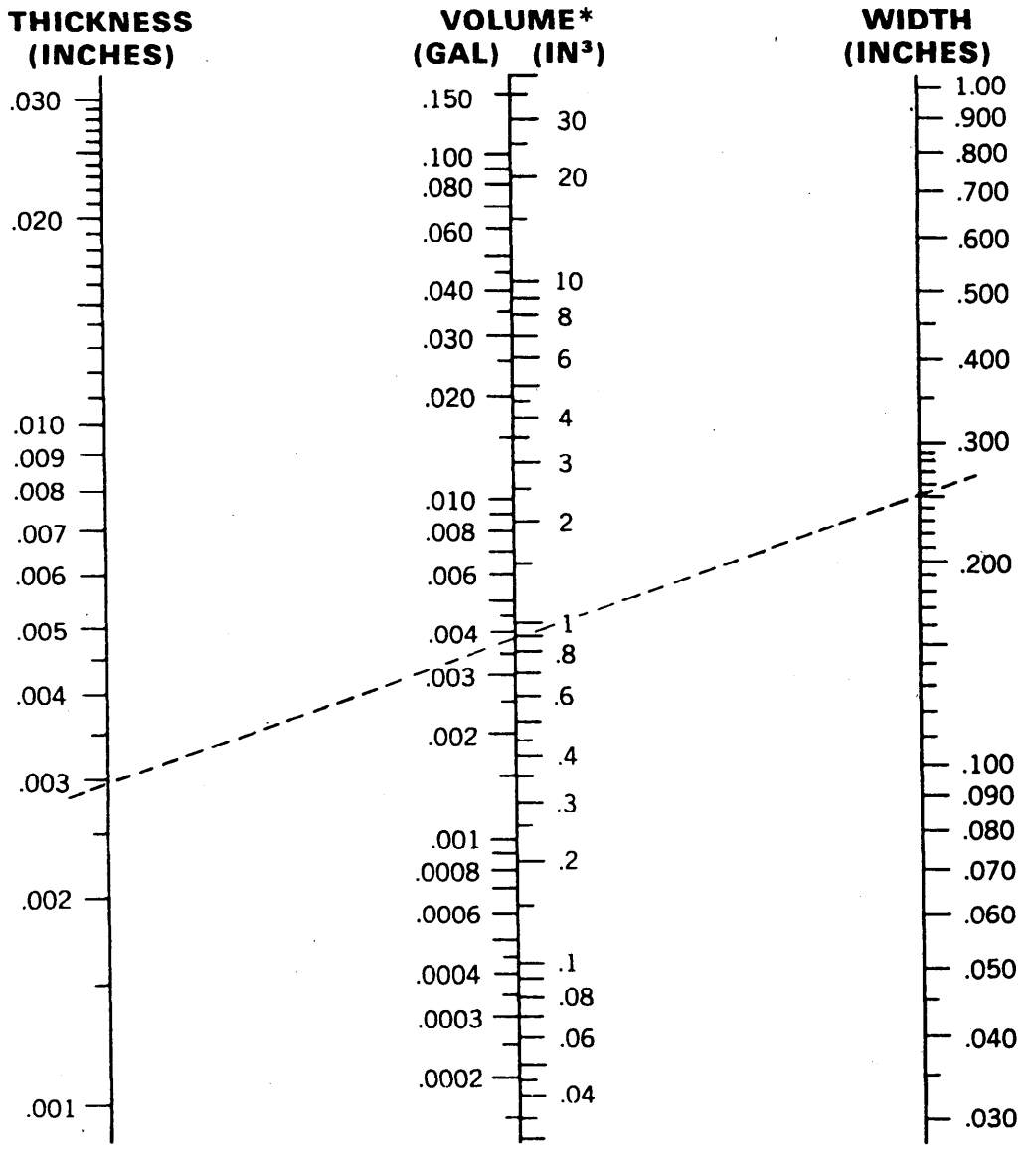
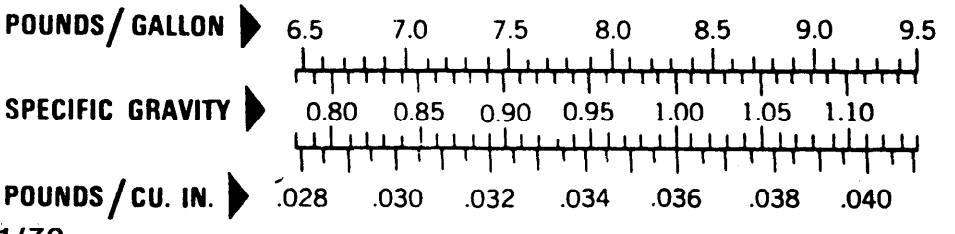
NOMOGRAPH FOR HOT MELT BEADS

MATERIAL REQUIRED PER 100 FEET



* NOMOGRAPH BASED ON FLAT BEADS ▬
* BEADS WITH A ROUNDED TOP SURFACE ◠ REQUIRE APPROXIMATELY ⅔ THE VOLUME SHOWN



ISSUED 9/1/70.

SUPERSEDES

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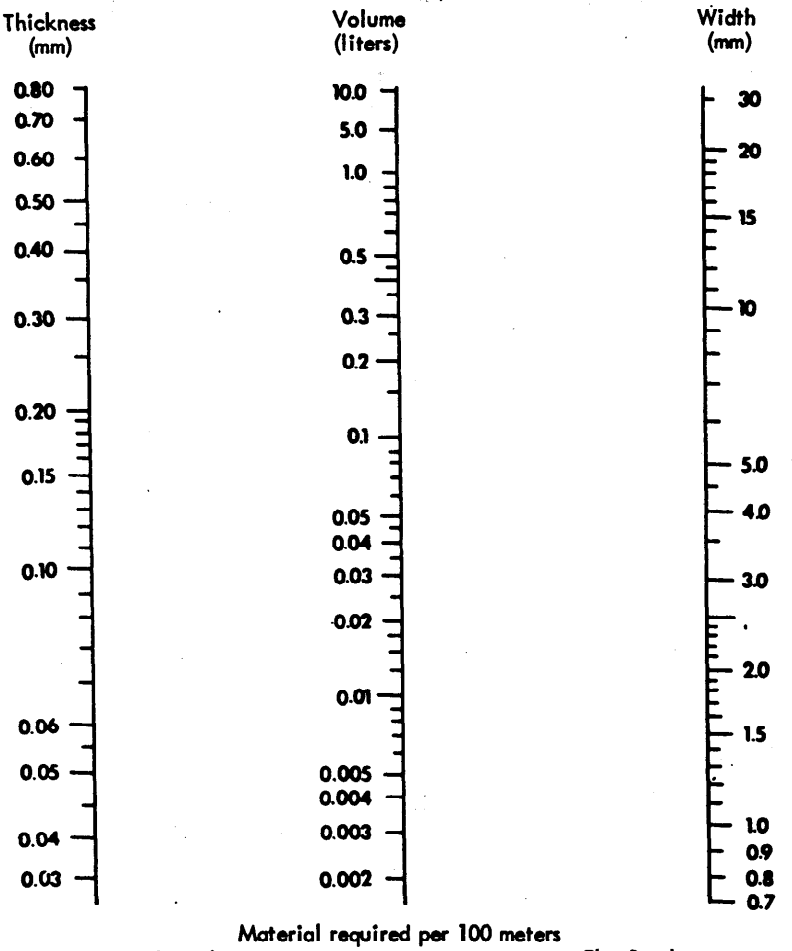
TECHNICAL PUBLICATION

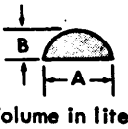
NOMOGRAPH FOR HOT MELT BEADS

METRIC



Material required per 100 meters

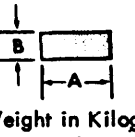
Rounded Bead



F = 0.66

Volume in liters = $\frac{A \times B \times F}{10}$

Flat Bead



F = 1.0

Weight in Kilograms = $\frac{A \times B \times F}{10}$ = Specific Gravity

EXAMPLE:

For a flat bead, 0.3 mm x 5.0 mm, with specific gravity of 0.9:

$$\text{Volume} = \frac{0.3 \times 5.0 \times 1.0}{10} = .15 \text{ liters/100 M}$$

$$\text{Weight} = \frac{0.3 \times 5.0 \times 1.0 \times 0.9}{10} = 0.135 \text{ Grams/100 M}$$

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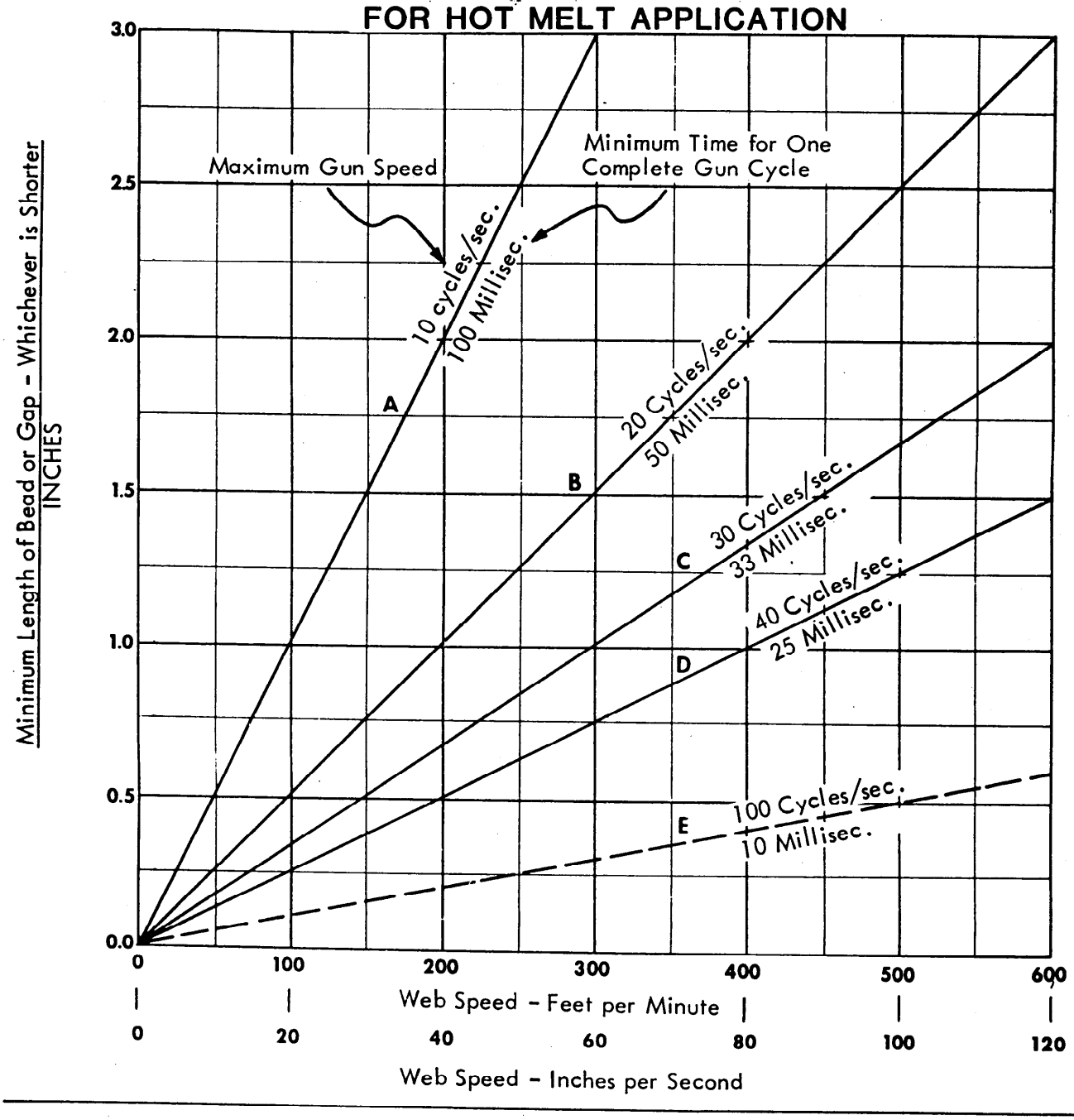
TECHNICAL PUBLICATION 40-0-7

MINIMUM BEAD LENGTH CHART FOR HOT MELT APPLICATION



NOTE: One Gun Cycle = One Bead + One Gap

Minimum Gun Cycle Length = 2 Times the Minimum Length shown at Left Side of chart

Curve B - #152 670 Nordson Automatic Gun with Pneumatic Operation
Curve A, C, D and E - Specific information not available

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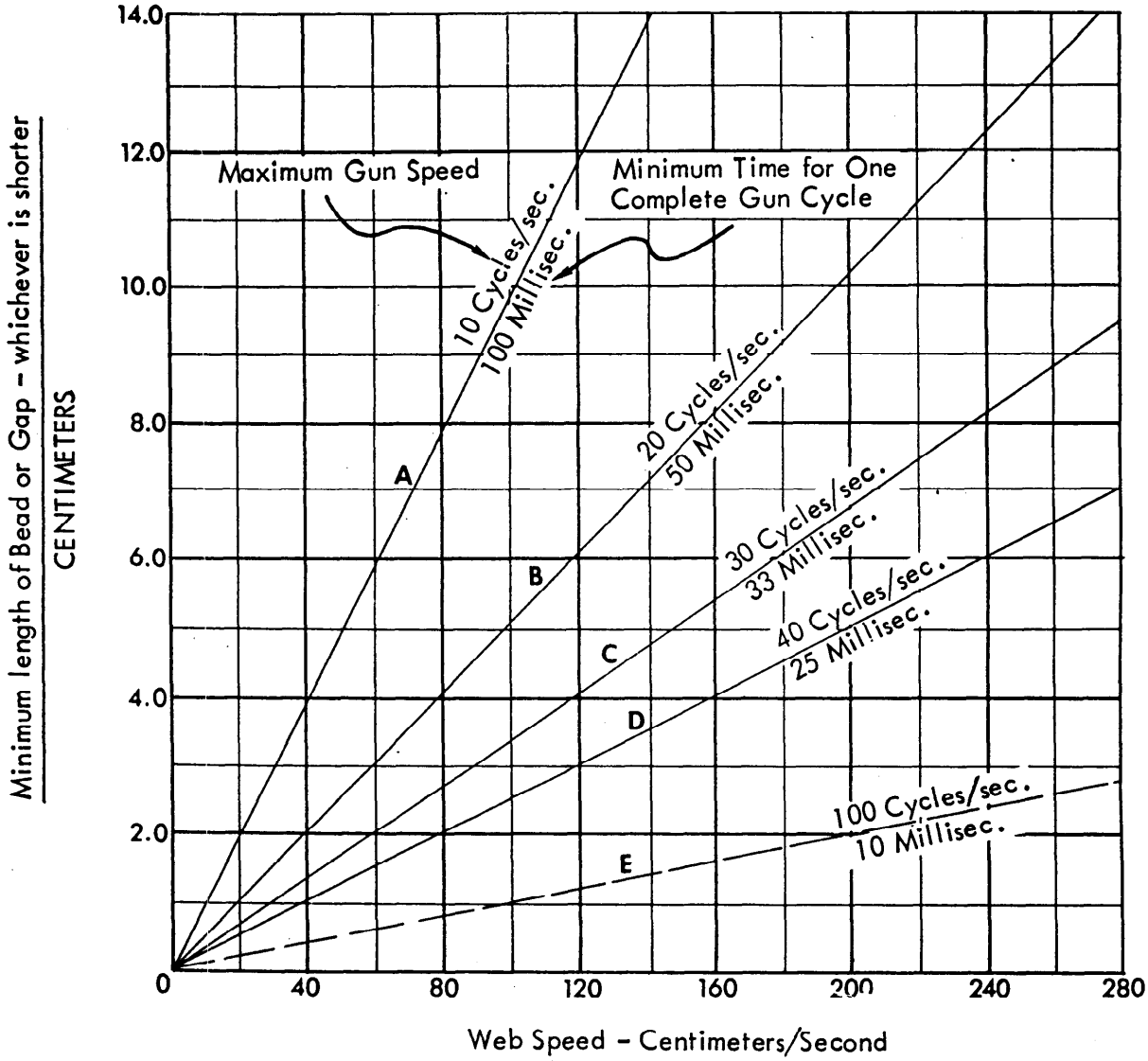
TECHNICAL PUBLICATION

MINIMUM BEAD LENGTH CHART FOR HOT MELT APPLICATION



NOTE: One Gun Cycle = One Bead + One Gap

Minimum Gun Cycle Length = 2 Times the Minimum Length shown at left side of chart.

Curve B - #152 670 Nordson Automatic Gun with Pneumatic Operation
Curve A, C, D, and E - Specific information not available.

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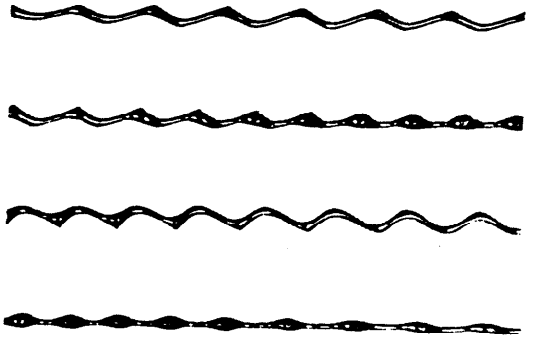
HOT MELT

FAULTS AND TROUBLESHOOTING CHART

The photographs below represent samples of bead faults commonly encountered in the application of hot melt adhesives. Trouble-shooting procedures are outlined on the pages that follow.

Cold Bead

Possible Causes:



A. Adhesive colder than recommended application temperature.

B. Ambient temperature in the application area below normal.

Example: Ice cream plant (cold draft blowing on nozzle)

C. A stream of air directed at guns and nozzles (radiation and convection) will cool the nozzle, gun, and adhesive.

D. Gun thermostat not of the proper temperature rating for the material in use.

E. The nozzle too far from the substrate.

Excess Amount in Triggering

Possible Causes:

A. Insufficient air pressure to the gun.

B. Insufficient air pressure to the pump.

C. The nozzle too far from the substrate.

D. Partially plugged nozzle.

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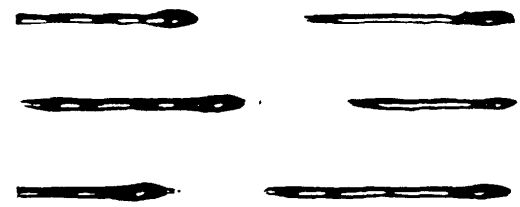
Stringing



Possible Causes:

A. Adhesive too viscous.

B. Cold adhesive.

C. Lack of an air-piloted relief valve between solenoid and gun.

D. Old adhesive (beyond recommended pot life).

Excessive Amount of Cut-off

Possible Causes:

A. Insufficient air pressure to the pump.

B. Cold adhesive.

C. Insufficient air pressure to the gun.

Concentric Circles

Possible Causes:

A. Material too hot.

B. Material low in viscosity.

C. High speed application (fast gun cycling).

HOT MELT TROUBLESHOOTING CHART

SYMPTOM/PROCEDURE	CORRECTIVE ACTION
Do not attempt to loosen any part of manifold, hose, or gun system until air to the unit has been turned off and pressure has been relieved from hot melt system by triggering the guns.	
Use safety goggles, safety gloves (P/N 902 514), and protective clothing to prevent injury from splashed hot material or hot parts.	
ADHESIVE BOUNCES OR SPLASHES FROM SUBSTRATE	
A1. Check adhesive temperature settings of applicator, hose and gun.	
NORMAL INDICATION: Adhesive temperature settings normal.	Normal Indication: Proceed to step A2.
	Abnormal Indication: Adhesive temperature too high. Reduce temperature.
A2. Check air pressure to applicator.	
NORMAL INDICATION: Air pressure to applicator within normal limits.	Normal Indication: Proceed to step A3.
	Abnormal Indication: Applicator air pressure too high. Reduce air motor air pressure at the regulator.
A3. Check adhesive viscosity.	
NORMAL INDICATION: Adhesive visocity within normal limits.	Normal Indication: None.

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HOT MELT TROUBLESHOOTING CHART (CONTINUED)

SYMPTOM/PROCEDURE	CORRECTIVE ACTION
	Abnormal Indication: Adhesive viscosity too low. Adjust one or more of the following parameters as necessary: 1. Reduce air motor air pressure. 2. Reduce application temperature. 3. Use lower flow-rated nozzle. 4. Use a higher viscosity adhesive.
ADHESIVE CHARRING IN TANK	
B1. Check tank temperature.	
NORMAL INDICATION: Tank temperature within normal limits.	Normal Indication: Proceed to step B2. Abnormal Indication: Tank temperature too high. Reduce tank temperature.
B2. Check tank temperature controller in accordance with applicator service manual.	
NORMAL INDICATION: Tank temperature controller functioning properly.	Normal Indication: Proceed to step B3. Abnormal Indication: Faulty temperature controller. Repair or replace controller.
B3. Check adhesive level in tank.	
NORMAL INDICATION: Tank full of adhesive.	Normal Indication: Proceed to step B4.

HOT MELT TROUBLESHOOTING CHART (CONTINUED)

SYMPTOM/PROCEDURE	CORRECTIVE ACTION
	Abnormal Indication: Adhesive level low. Keep tank full.
B4. Hot melt adhesive may be oxidizing in tank.	
NORMAL INDICATION: No oxidation in tank adhesive.	Normal Indication: None. Abnormal Indication: Hot melt adhesive oxidizing in tank. Keep tank lid closed. In extreme cases, change adhesive or use nitrogen gas blanket applicator.
ADHESIVE FUMING OR SMOKING	
C1. Check tank temperature setting.	
NORMAL INDICATION: Proper tank temperature setting.	Normal Indication: Proceed to step C2. Abnormal Indication: Tank temperature too high. Reduce temperature.
C2. Adhesive may be unstable (chars easily).	
NORMAL INDICATION: No char.	Normal Indication: None Abnormal Indication: Unstable adhesive. Use one or more of the following steps to reduce charring: 1. Keep tank lid closed. 2. Use a more stable adhesive. 3. Use nitrogen gas blanket applicator.

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HOT MELT TROUBLESHOOTING CHART (CONTINUED)

SYMPTOM/PROCEDURE	CORRECTIVE ACTION
ADHESIVE JELLING	
D1. Check temperature settings of applicator and hose.	
NORMAL INDICATION: Temperature settings in proper positions.	Normal Indication: Proceed to step D2. Abnormal Indication: Overheating. Drain and flush system in accordance with applicator service manual. Reduce temperature.
D2. Check compatibility by mixing adhesives in separate container.	
NORMAL INDICATION: Compatible mixture.	Normal Indication: Proceed to step D3. Abnormal Indication: Incompatible mixing. Drain and flush system in accordance with applicator service manual.
D3. Adhesive may be unstable.	Use a more stable adhesive.
ADHESIVE NOT PENETRATING SUBSTRATE	
E1. Check adhesive temperature.	
NORMAL INDICATION: Adhesive temperature within normal limits.	Normal Indication: Proceed to step E2. Abnormal Indication: Low adhesive temperature. Increase temperature slightly.

HOT MELT TROUBLESHOOTING CHART (CONTINUED)

SYMPTOM/PROCEDURE	CORRECTIVE ACTION
E2. Check substrate surface.	
NORMAL INDICATION: No coating on substrate.	Normal Indication: Check with adhesive representative for a compatible adhesive. Abnormal Indication: Coated substrate. Increase temperature slightly. If adhesive still does not penetrate, check with adhesive representative for compatible adhesive. NOTE: Flush and drain system in accordance with applicator service manual before changing adhesive.
E3. Check to see that adequate amount of adhesive is being applied to substrate.	
NORMAL INDICATION: Adequate amount of adhesive being applied to substrate.	Normal Indication: Contact adhesive representative for a compatible adhesive. Abnormal Indication: Insufficient adhesive. Use one or more of the following steps to increase adhesive flow: 1. Use higher flow-rated nozzle. 2. Increase temperature slightly. 3. Increase applicator air pressure.

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HOT MELT TROUBLESHOOTING CHART (CONTINUED)

SYMPTOM/PROCEDURE	CORRECTIVE ACTION
4. Change adhesive to another compatible adhesive with lower viscosity.	
ADHESIVE STRINGING	
F1. Check gun position relative to substrate in accordance with 43-1.	
NORMAL INDICATION: Proper height above substrate.	Normal Indication: Proceed to step F2.
	Adnormal Indication: Gun too far from substrate. Move closer to substrate.
F2. Check adhesive temperature and viscosity.	
NORMAL INDICATION: Adhesive temperature and viscosity within normal limits.	Normal Indication: Proceed to step F3.
	Abnormal Indication: Cold adhesive too viscous. Increase adhesive temperature slightly. Use lower viscosity adhesive.
F3. Check adhesive shelf-life.	
NORMAL INDICATION: Adhesive shelf-life recommended by adhesive manufacturer.	Normal Indication: Proceed to step F4.
	Abnormal Indication: Drain and flush old adhesive. Add new adhesive to tank.

HOT MELT TROUBLESHOOTING CHART (CONTINUED)

SYMPTOM/PROCEDURE	CORRECTIVE ACTION
F4. Check for cold air blowing on gun and/or low ambient temperature.	
NORMAL INDICATION: Normal ambient temperature with little air movement around gun.	Normal Indication: Check with adhesive manufacturer. Abnormal Indication: Cold air blowing on gun and/or low ambient temperature. Use one or more of the following steps to correct the problem: 1. Protect gun from air movement. 2. Increase adhesive temperature slightly. 3. Preheat substrate. 4. Heat ambient air.
AIR IN ADHESIVE	
G1. Check adhesive tank full of molten adhesive.	
NORMAL INDICATION: Adhesive tank full of molten adhesive.	Normal Indication: Proceed to step G2. Abnormal Indication: Adhesive melt tank empty. Refill tank and operate guns until bubble disappears.
G2. Check viscosity of adhesive.	
NORMAL INDICATION: Adhesive viscosity within normal limits.	Normal Indication: See MOISTURE BUBBLES IN ADHESIVE BEAD ON SUBSTRATE.

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HOT MELT TROUBLESHOOTING CHART (CONTINUED)

SYMPTOM/PROCEDURE	CORRECTIVE ACTION
	Abnormal Indication: Increase adhesive temperature slightly or use a lower viscosity adhesive material.
DEPOSIT FROM NOZZLES UNEVEN IN MULTI-GUN INSTALLATION	
H1. Check for clogged nozzles in accordance with gun service manual.	
NORMAL INDICATION: Adhesive flows freely through nozzle.	Normal Indication: Proceed to step H2.
	Abnormal Indication: Clogged nozzles. Clean nozzles in accordance with gun service manual.
H2. Check pressure drop across guns and nozzles.	
NORMAL INDICATION: Approximately equal pressure drop across all guns.	Normal Indication: None.
	Abnormal Indication: Unequal pressure drop across guns. Use one or more of the following steps to correct the problem: 1. Increase applicator air pressure. 2. Increase applicator temperature slightly. 3. Flush and clean guns and nozzles. 4. Use different flow-rated nozzle or guns.

HOT MELT TROUBLESHOOTING CHART (CONTINUED)

SYMPTOM/PROCEDURE	CORRECTIVE ACTION
5. Use flow-control valves in the lines.	
GUN DROOLING	
I1. Check gun needle and seat for wear and/or char.	
NORMAL INDICATION: Gun needle and seat clean with no indication of wear.	Normal Indication: Proceed to step I2. Abnormal Indication: Clean and/or replace worn parts in accordance with gun service manual.
I2. Check trigger adjustment in accordance with gun service manual.	
NORMAL INDICATION: Trigger adjustment within normal limits.	Normal Indication: None. Abnormal Indicator: Adjust trigger in accordance with gun service manual.
MOISTURE BUBBLES IN ADHESIVE BEAD ON SUBSTRATE	
J1. Apply adhesive to dry substrate and check for moisture bubbles.	
NORMAL INDICATION: No bubbles on dry substrate.	Normal Indication: Dry substrate prior to application of adhesive. Preheat substrate as necessary. Abnormal Indication: See AIR IN ADHESIVE.

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HOT MELT TROUBLESHOOTING CHART (CONTINUED)

SYMPTOM/PROCEDURE	CORRECTIVE ACTION
CARTON POP-OPEN AFTER LEAVING COMPRESSION SECTION	
K1. Check adhesive not cooling fast enough (too long an open time).	
NORMAL INDICATION: Proper open time.	Normal Indication: Proceed to step K3. Abnormal Indication: Proceed to step K2 if open time is too short. Use one or more of the following steps if open time is too long: 1. Decrease air pressure to air motor to decrease bead size. 2. Reduce adhesive temperature slightly. 3. Reduce line speed through compression. 4. Move guns further from substrate. 5. Increase distance from deposition to compression. 6. Increase compression length. 7. Cool substrate. 8. Use lower flow-rated nozzle. 9. Change bead pattern from constant to intermittent.

HOT MELT TROUBLESHOOTING CHART (CONTINUED)

SYMPTOM/PROCEDURE	CORRECTIVE ACTION
	10. Use adhesive with shorter open time. See adhesive manufacturer.
K2. Check adhesive cooling too fast (too short an open time).	
NORMAL INDICATION: Proper open time.	Normal Indication: Proceed to step K3. Abnormal Indication: Use one or more of the following steps to correct the problem: 1. Increase air pressure to air motor to increase bead size. 2. Increase adhesive temperature slightly. 3. Move guns closer to substrate. 4. Shorter distance from deposition to compression. 5. Heat substrate. 6. Use higher flow-rated nozzle. 7. Change bead pattern from intermittent to constant or increase bead length. 8. Protect deposit and/or gun from cold or moving air.

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HOT MELT TROUBLESHOOTING CHART (CONTINUED)

SYMPTOM/PROCEDURE	CORRECTIVE ACTION
	9. Use longer open time adhesive. See adhesive manufacturer.
K3. Check for sheared adhesive deposit.	
NORMAL INDICATION: Adhesive deposit not sheared.	Normal Indication: None Abnormal Indication: Sheared adhesive deposit. Ensure substrate is not twisted, jogged, or otherwise subjected to adverse movement in the compression section. See adhesive manufacturer if compression section is smooth.

Hot Melt Hose

45-0-0

NORDSON CORPORATION • AMHERST, OHIO • USA

HOT MELT HOSES - ⊘

Our instruction manuals clearly state that hot melt hoses are not to be placed inside of conduit but do not state a reason why.

Hot melt hoses should not be placed inside of any closed cover where heat cannot be dissipated from them. This includes electrical conduit, insulation of any type or tight metal covers. Complete failure of the hose can result if the hose is insulated beyond the insulation that is included with the hose.

If the thermocouple section is exposed to a lower temperature it will call for heat even though the extra insulated section is at, or above correct operating temperature. This will raise the temperature of the extra insulated section above the PTFE melting point. For this reason, customers should be cautioned against enclosing the hot melt hoses in any way that will cause overheating of the hose, and failure.

ADDITIONAL CAUTION:

Hot melt hoses should not be secured so that the hose has a large area of surface contact with a cold floor, cold steel, angle iron or other cold material. This may act as a heat sink reducing the temperature of the hose at that point and restrict the adhesive flow which could cause application problems.

NOTE: If a hot melt hose is to be used in an application where the hose is suspended by an overhead tool balancer or similar device it is recommended that a hose support be used to minimize damage to the hose.

The hot melt hose should be supported so that the minimum bend radius is no less than 6 inches, and so the weight of the hose will not compress the internal teflon tubing.

The hose support should neither act as a heat sink nor restrict the hose heat dissipation.

10/78 - Revised Information.

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ISSUED 10/78 SUPERSEDES 6/78
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AUTOMATIC HOT MELT HOSE - QUICK DISCONNECT - EXTERNALLY HEATED

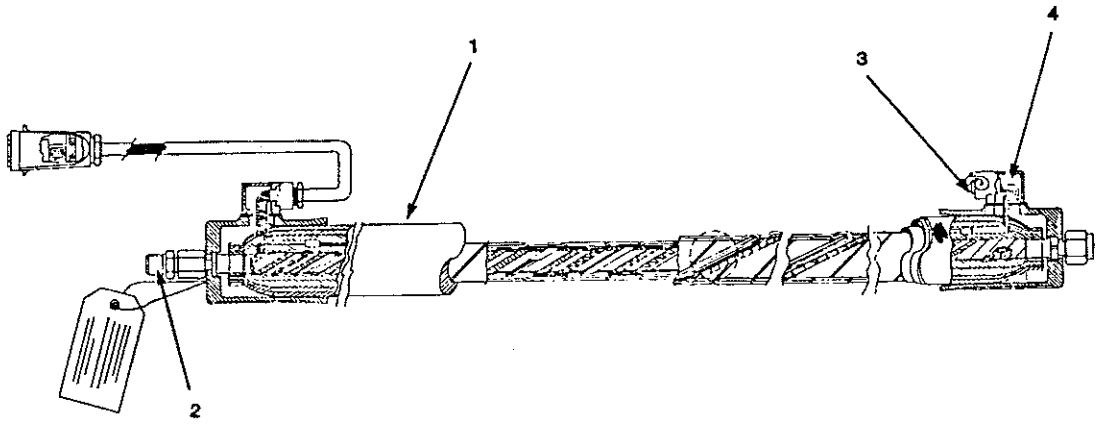

Figure 1 - Quick Disconnect Automatic Hot Melt Hose

HOSE CONSTRUCTION

The hot melt hose, shown in Figure 1, is designed for use with hot melt applicators and automatic extrusion guns equipped with quick-disconnect electrical fittings. It is an aircraft-type hydraulic hose constructed with a PTFE innertube and reinforced with stainless steel wire braid. Heat is generated in the hose by a serpentine heating element spirally wrapped around the wire braid. Insulation is provided by wrapped layers of fiberglass, polyester felt, and vinyl tape. The hose is covered with polyester braid for abrasion resistance.

An electrical cordset with connectors runs the length of the hose to provide electrical power to the gun. The 2 ft (0.6 m) hose cordset contains a diode in the heater wiring to compensate for resistance in the hose heaters.

Electrical power to the hose and gun is 230 VAC from the hot melt applicator control console. Temperature in the hose is monitored and controlled by a resistance temperature detector (RTD) in the hose wall and solid-state circuitry in the hot melt applicator cabinet.

Hoses sold for use in Japan and other low voltage areas are specially designed to operate on 200 VAC. They are identical in appearance to 230 VAC hoses except for a red tracer stripe in the hose sheathing.

Figure 2 shows the electrical schematic for the hot melt hose and cordset.

ISSUED 1/84
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SUPERSEDES 12/82
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Publication No. 104 465A

Nordson P&A Division Atlanta, Georgia

TECHNICAL PUBLICATION

TABLE 1 - HOSE ELECTRICAL DATA

Part No.	Length ft (m)	Voltage (VAC)	Power (watts)	Cold Resistance (ohms)
272 863	2 (0.6)	230	47	1040 - 1149
274 323	2 (0.6)	200	52	723 - 799
272 838	4 (1.2)	230	100	485 - 536
274 324	4 (1.2)	200	104	361 - 399
272 839	6 (1.8)	230	153	316 - 350
274 325	6 (1.8)	200	156	237 - 262
272 840	8 (2.4)	230	206	227 - 250
274 326	8 (2.4)	200	208	170 - 188
272 841	10 (3.1)	230	267	175 - 194
274 327	10 (3.1)	200	260	136 - 150
273 624	16 (4.9)	230	420	107 - 118
274 328	16 (4.9)	200	416	81 - 90

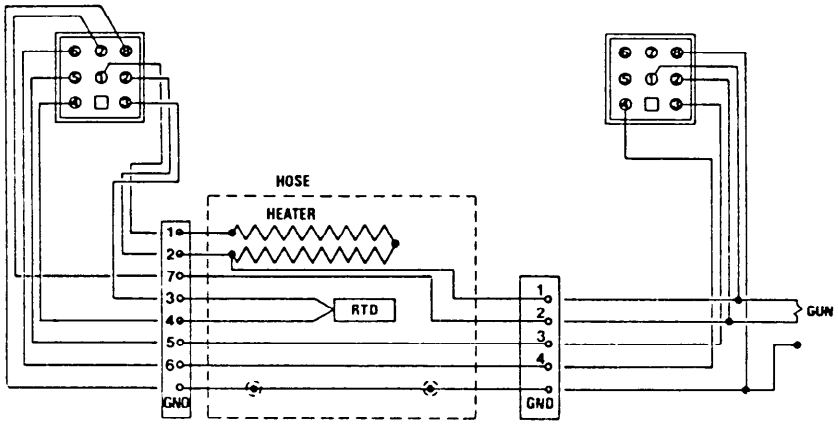

Figure 2 - Quick Disconnect Automatic Hot Melt Hose Electrical Schematic

ISSUED 5/85

LITHO U.S.A.

SUPERSEDES 1/84

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TABLE 2 - PARTS LIST FOR FIGURE 1

Item No.	Part No.	Description	Req'd
1	272 863	Automatic Hot Melt Hose, w/Diode, 2 ft (0.6 m), Quick Disconnect, 230 VAC	Ref
1	274 323	Automatic Hot Melt Hose, 2 ft (0.6 m), Quick Disconnect, 200 VAC	Ref
1	272 838	Automatic Hot Melt Hose, 4 ft (1.2 m), Quick Disconnect, 230 VAC	Ref
1	274 324	Automatic Hot Melt Hose, 4 ft (1.2 m), Quick Disconnect, 200 VAC	Ref
1	272 839	Automatic Hot Melt Hose, 6 ft (1.8 m), Quick Disconnect, 230 VAC	Ref
1	274 325	Automatic Hot Melt Hose, 6 ft (1.8 m), Quick Disconnect, 200 VAC	Ref
1	272 840	Automatic Hot Melt Hose, 8 ft (2.4 m), Quick Disconnect, 230 VAC	Ref
1	274 326	Automatic Hot Melt Hose, 8 ft (2.4 m), Quick Disconnect, 230 VAC	Ref
1	272 841	Automatic Hot Melt Hose, 10 ft (3.1 m), Quick Disconnect, 230 VAC	Ref
1	274 327	Automatic Hot Melt Hose, 10 ft (3.1 m), Quick Disconnect, 200 VAC	Ref
1	273 624	Automatic Hot Melt Hose, 16 ft (4.9 m), Quick Disconnect, 230 VAC	Ref
1	274 328	Automatic Hot Melt Hose, 16 ft (4.9 m), Quick Disconnect, 200 VAC	Ref
2	972 628	° Connector Assembly, Hose	1
-	945 032	°° O-ring, Viton, 0.38 in.	1
-	-	°° Connector, Male, 9/16-18, O-ring Boss	1
3	272 848	° Dustcover, Connector	1
4	272 856	° Receptacle, Connector	1
-	939 528	° Socket, Crimp Contact*	3

* A special tool to aid in removal and replacement of crimp sockets is available. Order P/N 274 126.

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Publication No. 104 465A

Nordson® Packaging and Assembly Division
Atlanta, Georgia

TECHNICAL PUBLICATION

SERIES 2000 HOT MELT APPLICATORS IN WATER WASH DOWN APPLICATIONS

Nordson Series 2000 hot melt applicators are not designed for water wash down environments and must be protected from hose directed water. Water may enter unit. Failure to follow these instructions may result in electrical shock and equipment damage.

Use the following guidelines to protect the applicator in the event Series 2000 hot melt applicators are used in water wash down applications:

1. Mount the applicator so that it is above any draining or dripping areas.

2. Route hoses and electrical conduit so water will not run down the hose, hose cordset, or input electrical cable into the applicator.

3. Provide a metal or plastic shield between the applicator and any source of water spray or mist. The shield should not impair heat dissipation from the applicator or hoses.

ISSUED 1/84
LITHO U.S.A.

SUPERSEDES

Publication No. 104 465A

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Miscellaneous Technical Data

Hot Melt

NORDSON CORPORATION • AMHERST, OHIO • USA

Nordson Corporation welcomes requests for information, comments and inquiries about its products.

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NORDSON TYPE R CLEANING SOLVENT

The flash point of Type R solvent is 550°F (288°C). Do not heat this material above 475°F (246°C). Do not heat Type R solvent with an open flame or in an uncontrolled heating device (for example, a small pan or unregulated hot plate). A fire hazard may exist if an open flame or uncontrolled hot plate is used to heat Type R solvent. A controlled heating device (such as a small deep fat fryer or thermostatically controlled hot plate) should be used to heat the solvent above the melting point of the adhesive.

PHYSICAL PROPERTIES

Flash Point:	550°F (288°C)
Freeze Point:	32°F (0°C)
Vapor (Odor):	None
Color:	Clear
Viscosity:	5,600 CPS @ 77°F (25°C)
Pounds/Gallon (kilograms/liter):	9 (1)
Molecular Weight:	3,300
	Non-irritating to skin
	Non-toxic

Type R solvent meets the requirements of the following FDA regulations:

175.105
175.300
175.380
175.390
176.170
176.180
177.1010
177.1210

USDA approved for use in food processing plants for cleaning hot melt adhesive applicating equipment as long as there is no direct contact with the food.

Do not take internally. Keep out of reach of children.

USAGE

Type R solvent may not be compatible with all adhesives. Before using Type R solvent with an adhesive for the first time, test for compatibility using the procedure described below.

NOTE: For ease of pouring, store Type R solvent at room temperature 70°F (21°C). Do not store Type R solvent at temperatures over 150°F (65°C).

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SUPERSEDES 3/81
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USAGE, (Continued)

To clean parts exposed to hot melt, nozzles, and filters, soak the parts in heated Type R solvent at a temperature somewhat above the normal adhesive application temperature, but less than 475°F (245°C).

When cleaning the AD-24 drop-in cartridge with Type R solvent, do not submerge the entire cartridge in the solvent. Be certain the pneumatic section (top) of the cartridge is not inserted in the molten solvent. The mixture of Type R solvent and molten adhesive will cause the pneumatic section to sieze.

If a question concerning the compatibility of Type R solvent and a specific adhesive arises, consult the adhesive supplier or use the following test:

1. Heat the mixture slightly above the application temperature.

2. Note changes in the mixture:

   a. Discoloration.
   b. Increase in viscosity.
   c. Gelling.
   d. Separation of any ingredients in the mixture.
   e. Sharp drop in viscosity.

Do not use Type R solvent when flushing equipment using Polyamide, Surlyn, Polyester or certain other high performance hot melt materials. A gelled contaminant may form which will cause nozzle plugging and charring in the various heated components.

Before using a cleanout material other than Nordson Type R solvent, check to be sure the material meets these specifications:

1. Non-toxic and non-sensitizing.
2. Does not produce toxic vapors when heated.
3. Flash point at least 50°F (28°C) above intended use temperature.
4. Non-corrosive.

Refer to the specific Nordson applicator service manual for additional information regarding the use of Type R solvent.

Part No.	Description
270 755	Solvent, Type R, 1 Gallon (3.8 Liters)
270 756	Solvent, Type R, 5 Gallon (18.9 Liters)
270 757	Solvent, Type R, 55 Gallon (208.2 Liters)